# REPORT

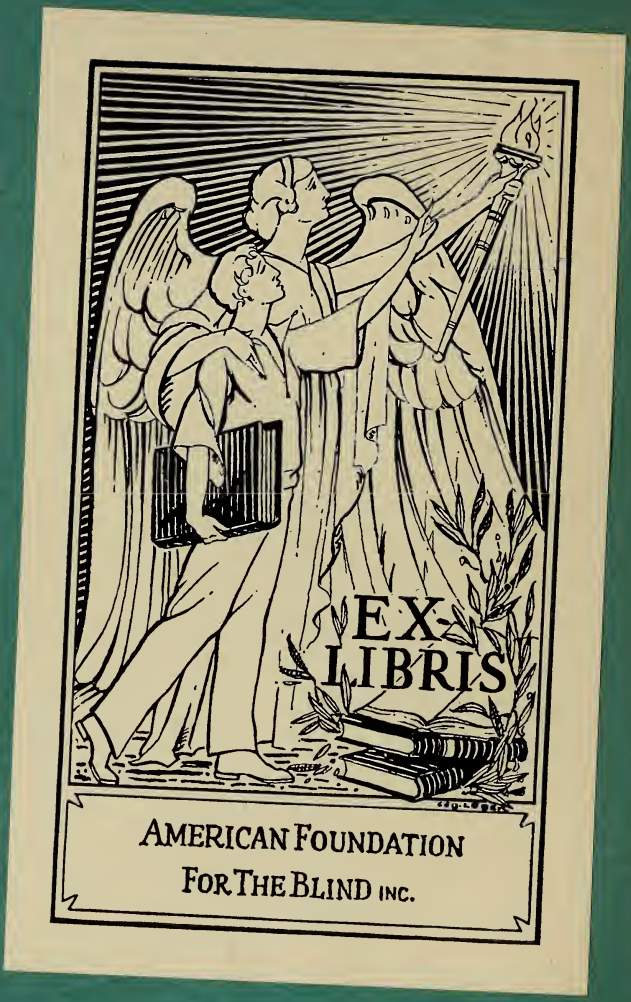
ON

# THE PREVENTION OF BLINDNESS

BY

THE STANDING COMMITTEE ON
THE PREVENTION OF BLINDNESS
OF THE UNION OF COUNTIES
ASSOCIATIONS FOR THE BLIND

1936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† Now deceased. (See " Foreword.")

# FOREWORD

THE Committee, in presenting their Report, wish first to put on record their grateful appreciation of the help they have received from various sources, and particularly to acknowledge the generous financial support of the Worshipful Company of Clothworkers and the National Institute for the Blind, through which the preparation and printing of this Report has been made possible.

Valuable advice and assistance have been given by the Ministry of Health, the Board of Education, the Home Office, the Mines Department, and the Medical Research Council, through which the valuable services of Mr. W. T. Russell of the Statistical Department were enlisted on behalf of the Committee (Appendix VI. to the Report embodies Mr. Russell's analysis of the data submitted to him).

The Committee are also indebted to the National Union of Agricultural Workers and the National Safety First Council for their assistance, to the British Hospitals Association for help in collecting the information contained in Appendix VII., and to the International Labour Office for supplying the information upon which Appendix X. is based. The reproduction of extracts from the Report of the Chief Medical Officer of Health of the Board of Education and of Circular 1353 and Form B.D. 8 of the Ministry of Health, as Appendices I., III. and IIIA. of this Report, is by kind permission of the Controller, His Majesty's Stationery Office.

The Committee also wish to express here, as well as in the text of the Report, their sincere appreciation of the help given by Medical Officers of Health of County and County Borough Councils in the investigation upon the result of which Chapter III. is largely founded, and to acknowledge the assistance of the Medical Officers of Authorities (other than County

and County Borough Councils) responsible for Maternity and Child Welfare services and Elementary Education, shown in their excellent response to a written enquiry. Special thanks are due to the Medical Officers of Health for supplying the returns of cases of Ophthalmia Neonatorum, which have enabled the Committee to make the statistical survey contained in Appendix VI.

The Committee as a whole record their appreciation of the work of the Drafting Sub-Committee, whose considerable labours in the preparation of the Report have been continuous over the last two years. The Committee are unable to single out for individual mention many persons who, in various capacities, have contributed to the usefulness of the Report by placing their counsel and experience at the service of their Drafting Sub-Committee, but take this opportunity of expressing their grateful thanks for all the help they have received. They wish, however, to record the untiring zeal and devotion with which their Secretary, Miss Cracknall, has undertaken the many heavy duties and responsibilities which the Committee have placed upon her and their appreciation of the admirable service she has at all times given.

It is with very deep regret that the Committee have to record the deaths of Dr. A. Eichholz, Mr. J. Herbert Fisher, Mr. J. B. Lawford, Mr. Bernard Cridland, and of Mr. F. R. Lovett. They rendered valuable service in the preliminary investigation in the preparation of this Report and in the furtherance of the object for which the Committee was established.

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The subject of "Hereditary Blindness" has not been dealt with at length in the pages which follow, as the Committee have already published a Report under this title. The Report on Hereditary Blindness (issued 1933) is almost out of print, but the Committee's main conclusion on the subject has been placed among the recommendations contained in Chapter V. of this Report.

# REPORT

ON

# THE PREVENTION OF BLINDNESS.

## CHAPTER I.

## INTRODUCTORY.

### General.

1. There is at the present day a great deal of blindness which might have been prevented if suitable precautions had been taken in time. There is also a definite number of cases where some degree of useful sight in the blind can be restored if proper measures be taken. These are two of the factors which led to the formation of the Prevention of Blindness Committee.

Our first duty is to ascertain, as fully as possible, the causes of blindness and their relative prevalence. The adoption of preventive measures has already produced a marked improvement, and conditions are very different to-day from what they were sixty years ago. A short history of what has been accomplished during the last sixty years forms a natural preface to our Report.

### Historical.

2. In England the movement towards prevention of blindness began about 1879 with the formation of a Society for the Prevention of Blindness and the Improvement of the Physique of the Blind. In 1880 the aims of this Society (which is sometimes referred to as the " London Society for the Prevention of Blindness ") were placed before the International Congress of Hygiene in Turin by Dr. Roth, its Honorary Secretary, and it was decided that prevention of blindness should form one of the questions to be discussed at the International Congress to be held in Geneva two years later.

3. The credit for one of the first great steps in prevention of blindness must be given to Credé, Professor of Obstetrics in Leipzig, who discovered, in 1881, that a solution of silver

nitrate instilled into a baby's eyes immediately after birth would prevent the occurrence of Ophthalmia Neonatorum. This epoch-making discovery was destined to save the sight of many children, but, although it could be applied to children born in hospitals or institutions, there were at that date no official means of securing its routine use at every birth.

The London Society made a valiant attempt to spread the knowledge of Credé's discovery and to arouse public interest in the hygiene of the eye by the publication and gratuitous distribution of leaflets dealing mainly with the nature and treatment of Ophthalmia Neonatorum. This comparatively small action was followed by one of far wider significance. The Society was enabled, through an anonymous donor, to offer a generous money prize for the best essay on the Prevention of Blindness, without distinction of nationality. This offer was accepted by the Geneva Congress of Hygiene in 1882, and the report of a Committee of eminent ophthalmologists, who were the adjudicators, was made to the International Congress in 1884. In 1885, on the occasion of the Fifth International Congress held at The Hague, the prize was awarded to a young professor of ophthalmology, Dr. Ernst Fuchs, then of Liège, and later practising in Vienna, whose essay on the Causes and Prevention of Blindness became a standard work and has been translated into many languages. This essay was the first step in a career which led to Fuchs being recognised as the leading ophthalmologist of the world. On the occasion of the International Congress of Ophthalmology in 1929 he was awarded the Dana Gold Medal for outstanding services to humanity in the prevention of blindness.

4. In 1883 Dr. Roth, of the London Society, read a paper before a Conference held at the Manor House, York, in which he outlined the practical steps to be taken for the prevention of blindness. Taking into account the fact that his paper was read over fifty years ago, it is interesting to note how succinctly the following phrases forecast our own aims:—

> " (1) To study and to know the *causes* of blindness.
>
> (2) To enquire whether these causes can be prevented, counteracted or removed.
>
> (3) To name the practical means for preventing blindness."

5. Dr. Roth passed in rapid review the medical and industrial causes of blindness according to the knowledge of his time, and a quotation may serve to show that some progress has been made in the direction pointed out by him half a century ago:—

> " Having now finished my observations on the causes of blindness, I wish to direct your attention to some other more important

causes of blindness, called *Ignorance* and *Neglect*. Without any graphic table of these causes, permit me to mention that we have here four principal groups—

(1) Ignorance, regarding general and specially ocular hygiene, of mothers, nurses, and all those to whom the care of infants is entrusted.

(2) Ignorance of schoolmasters and school mistresses in matters of health and physical education.

(3) Ignorance and neglect of the working classes regarding the injurious influences affecting their general health, and causing diseases of the eyes.

(4) Ignorance of many medical men regarding the knowledge and treatment of eye diseases."

In connection with the fourth group, later in the same paper Dr. Roth made the following quotation from the Report of the Geneva Congress of 1882:—

"The majority of the infantile and other eye diseases are curable if not neglected; therefore it is of the greatest importance that all medical men should pass through a theoretical and practical course and examination in the treatment of eye diseases."

6. The London Society for the Prevention of Blindness did not long survive, but it seems to have been the first organised movement for the prevention of blindness in this country, and to have provided a stimulating example of preventive effort even after it had ceased to function, and had lost, through death, its most ardent supporters.

7. In 1889 the Royal Commission on the Blind, Deaf and Dumb issued their Report, and made the following recommendations on the prevention of blindness:—

"That the intermarriage of the blind should be strongly discouraged.

That information respecting the treatment of purulent ophthalmia should be circulated by the sanitary authority, or through the post office.

That children with defective sight in elementary schools should be periodically examined by a medical officer, and the use of glasses, &c., ordered, so as to preserve their sight as much as possible.

That greater attention to ophthalmic surgery should be encouraged among general practitioners."

In reference to the last recommendation, the Commission remarked, in the body of their Report:—

"It has been stated as desirable that a more special knowledge of ophthalmic surgery among general practitioners should

be encouraged. We, therefore, learn with satisfaction that a general knowledge of ophthalmic surgery, among medical practitioners, is regarded as an essential part of a professional education, and that the treatment of the diseases of the eye is increasingly commanding attention, in the general infirmaries of the country, as well as in the special hospitals."

8. The next record of official, as distinct from lay or scientific, activity which we have been able to trace tells us that in 1903 legislative action was taken by the Governor of the State of New York, who appointed Special Committees to investigate the condition of the blind and to report on this and on the causes of blindness. One important outcome was the formation of the New York Committee for the Prevention of Blindness in 1908. This State Committee became the National Committee for the Prevention of Blindness in 1915, and in 1928 the name was changed to the National Society. The growth of the Society was rapid, and their activities now cover a wide field of propaganda. Information about the Society's work for the conservation of vision is conveyed to the masses by means of lectures, pamphlets, the press, and, in more recent years, the radio. A description of the Society's work in following up hospital cases of potential blindness, through the services of specially trained Social Workers, is given in Appendix I.

9. An important step towards the prevention of blindness in this country was taken in 1909 when, through the efforts of the late Mr. E. V. Greatbach, of Stoke-on-Trent, notification of Ophthalmia Neonatorum was made compulsory, and nursing provided for that disease in the pottery towns of Staffordshire, of which the first to adopt these measures was Stoke-on-Trent. Notification was secured by extending, with the approval of the Local Government Board, the provisions of the Infectious Diseases (Notification) Act, 1889, and in 1911 the London County Council obtained similar powers under Section 55 of the Public Health (London) Act, 1891.

Between 1909 and 1914 application to extend the provisions of the Infectious Diseases (Notification) Act, 1889, to Ophthalmia Neonatorum had been made by 275 Sanitary Authorities with an aggregate population of 13 millions, including the four largest towns in England. In February, 1914, notification of the disease was made compulsory in England and Wales by a General Order of the Local Government Board, under the Public Health (Ophthalmia Neonatorum) Regulations, 1914. Before this, however, Dr. Nimmo Walker, of Liverpool, wrote in 1913:—

> " In Liverpool, by the co-operation of the Health Authority and St. Paul's Eye Hospital, provision is made for the inspection and treatment of cases of ophthalmia immediately on notification. In 1908 St. Paul's Eye Hospital started a special

> Ophthalmia Neonatorum Department, and obtained the help of the Local Health Authority both in the early discovery of cases by means of the notification clause of the Midwives Act, and in the loan of an ambulance to remove mother and child, if necessary, to the Ophthalmia Ward of the hospital. In 1910 a lady inspector of Ophthalmia Neonatorum, a nurse who had been specially trained in the Ophthalmia Department of the hospital, was placed upon the staff of the Medical Officer of Health . . . . . .
>
> In 1912 the position was strengthened by the adoption of compulsory notification of all cases of Ophthalmia Neonatorum, under the Infectious Diseases Act, which makes notification compulsory not only for midwives but for doctors also. The results show in a striking way the value of prompt discovery and treatment."

We describe the present arrangements for the notification and treatment of Ophthalmia Neonatorum in Chapter III., paragraphs 66 to 83.

10. The Departmental Committee on the Welfare of the Blind issued their Report in 1917; this Report contained, *inter alia,* a number of recommendations affecting the notification and treatment of Ophthalmia Neonatorum, which are evidence that the arrangements then in force were capable of considerable extension and improvement.

11. In 1920 the Minister of Health in England set up a Departmental Committee to report upon the Causes and Prevention of Blindness. The Report, which appeared in 1922, was, in the opinion of ophthalmologists and laymen alike, one of the most able and exhaustive reviews of the subject published in this or any country, and still remains a standard work. It is to be deplored that copies are no longer obtainable as it is out of print.

The Report further reinforced the recommendation of the Royal Commission of 1889 with regard to ophthalmic training of doctors in the following words:—

> " We recommend that the General Medical Council again be urged to insist that every student presenting himself for a qualifying examination in medicine shall be examined in ophthalmology."

We are informed that in 1919 the Council of British Ophthalmologists had already submitted the following resolution to the General Medical Council:—

> " No student shall be considered to have passed the qualifying examination unless he has shown a sound knowledge of practical ophthalmology in an examination conducted by ophthalmic surgeons."

As a result, the General Medical Council embodied the following paragraph in a resolution on professional education which came into force in May, 1923:—

> " That instructions should be given, *inter alia,* to every medical student in diseases of the eye, the principles of refraction and the use of the ophthalmoscope."

Subsequently, when the Departmental Committee of 1922 forwarded their Report and the recommendation quoted above to the General Medical Council, they were informed that the Council had had the matter under consideration, and believed that they had anticipated, by their resolution of May, 1923, the wishes of the Departmental Committee (whose Report reached them at a later date) by making provision for medical students to receive instruction in ophthalmology on the lines already indicated.

We are satisfied that the present arrangements do not secure that in general the medical practitioner has the requisite knowledge of ophthalmology, and consider that the matter should continue to receive the close attention of the Curriculum Committee of the General Medical Council.

12. Throughout our Report we shall refer to the recommendations of the Departmental Committee of 1922.

Statutory effect was given to one of the most important recommendations of this Committee in Section 66 of the Public Health Act, 1925, which reads:—

> " Without prejudice and in addition to any other power under any other Act, a county council or local authority shall have power, with the consent of the Minister of Health, to make such arrangements as they may think desirable for assisting in the prevention of blindness, and in particular for the treatment of persons ordinarily resident within their area suffering from any disease of or injury to the eyes." (*See* Chapter III., paragraph 121.)

13. Until the publication of the League of Nations Report on the Welfare of the Blind in various Countries, issued in 1929, we possessed no official data regarding the causes of blindness, nor of the measures taken for the prevention of blindness, in countries other than Great Britain and America. An authentic record of the data supplied by twenty-three Governments who were members of the League of Nations in various parts of the world is given in Appendix 11 to the League of Nations Report. This Appendix provided a number of statistics as to the causation of blindness and the methods of prevention of blindness in various countries. Part II. embodied a valuable Memorandum, prepared by the International Labour Office, on the occupational causes of blindness, which makes clear the need for further protective

measures in industry. The Memorandum contains statistics from several countries, including Great Britain, describes preventive measures enforced by statute, or otherwise, and refers to the remarkable book on *Eye Hazards in Industrial Occupations* by Resnick and Carris.

14. Later in 1929, a Report on the Prevention of Blindness was published by the League of Red Cross Societies. Chapters IV. and V. contained a review of the causes of blindness in various countries, and a general survey of the prevalence of certain major causes is given under the headings of Trachoma, Syphilis, Gonorrhœa, Ophthalmia Neonatorum, Small-pox, Congenital Defects, and Accidents, and references appear in foot-notes. Chapter VII. deals with activities for the prevention of blindness, and gives some indication of the diseases which appear, on the information available, to be the most frequent causes of blindness in the countries under review.

15. Two important developments for the prevention of blindness took place in the same year. In September, 1929, at Scheveningen, the International Association for the Prevention of Blindness was formed under the presidency of Professor de Lapersonne, of Paris. This Association has held yearly meetings since that date, has appointed Sub-Committees on various subjects, and in 1933 set up a Commission to examine, impartially and without haste, the problems raised by the classification of the causes of blindness.

The formation of a League against Trachoma was considered at Scheveningen in 1929, and, in July, 1930, the International Organisation against Trachoma was established at Geneva, under the presidency of Professor Emile de Grosz, of Budapest. Two representatives of the International Association for the Prevention of Blindness are members of the League against Trachoma, and a useful relationship is thus maintained between the two organisations.

## Data of the Causation of Blindness.

16. Turning from this sketch of the history of the movement for the prevention of blindness, we are confronted with a scarcity of material from which reliable conclusions can be drawn and on which sound action can be based. The main causes of blindness are well known and are dealt with in Chapter II. But a general knowledge of the causes alone is not sufficient guide for preventive propaganda and action because some causes may occur very rarely and others very commonly. The existing data may be classified as follows:—

(*a*) Records of ophthalmic hospitals;

(*b*) Records of private cases kept by ophthalmologists;

(*c*) Records of limited groups of blind persons, *e.g.*, school records;

(*d*) Data from other countries; and

(*e*) Data derived from the register of blind persons kept by Local Authorities (or Voluntary Societies as their agents) in accordance with schemes made by the Local Authorities under the Blind Persons Act, 1920.

17. Different limitations apply to each of the above groups. The records of ophthalmic hospitals are not kept on a uniform system, and, even if they could be made available, they would require much care in comparison and analysis. The records of private cases, kept by ophthalmologists, one example of which is quoted in the Report of the Departmental Committee of 1922, have the defect of being a sample which is not typical of the population as a whole because, broadly, it is limited to persons of means who can afford to pay fees. Data such as school records are samples limited in another way, by age, and will give a false picture of the distribution of the causes of blindness throughout the population generally. Data from other countries are apt to be very misleading unless it is known what are the criteria of blindness and the methods by which the data were obtained. The data obtained from the register of the blind satisfy some of the necessary conditions. They are not a sample, but a fairly complete record of persons from the whole country of all ages and of all kinds of occupations. Registration is not compulsory, and there is reason to believe that it misses a number of the well-to-do. But the data obtained through registration have suffered from a further defect. In a large number of cases the causation of blindness had been determined by lay opinion and not by an ophthalmologist.

18. The Departmental Committee on the Causes and Prevention of Blindness were forced to base their conclusions upon statistics which were not sufficiently comprehensive to give a proper perspective. The Report (paragraph 15) states that the examination of small blocks of individuals would not necessarily be an index of the whole blind population, and the preponderance of children among the samples taken is further emphasised by the fact that, in the analysis of the causes of blindness in the Departmental Committee's Report, among 4,146 persons examined approximately two-thirds were children under sixteen.

19. The value of statistical records depends, *inter alia*, upon uniformity in classification as well as upon a definite standard of judgment in the examination of every patient. This belief

is reinforced by medical opinion in other countries, and particularly in Germany. As long ago as 1899 Dr. Eugen Fick, of Zurich, in his book *Die Blindheit,* referred to the " confusion of cause and of anatomical condition " which prevented the establishment of sound statistics of the causes of blindness. The same point is made in subsequent papers and treatises on the subject. Dr. Fick first outlined the procedure necessary to arrive at an approximately accurate estimate of the percentage of blind persons to the whole population. He advocated that every case of blindness ascertained through the census should be sought out, examined and recorded on a standard form by an ophthalmic surgeon, and that the information thus collected should be classified by one person. This procedure was also advocated by Katz and Magnus.

The wisdom of Dr. Fick's observations is endorsed by our own experience and also by a document dealing with the German census of 1925-26, which embodies statistics worked out by the State Statistical Office in Berlin, with the help of Dr. Wilhelm Feilchenfeld. The difficulties of classification were enhanced by the impossibility of bringing all cases of blindness to an oculist for examination, the inequality of grouping due to variance of opinion among those making the classification, and the need for drawing a sharp distinction between the local condition of the eye and the cause of blindness, a technical point which was lost upon some of the examiners. Subject to these qualifications, the statistics revealed a decrease of over 50 per cent. in the incidence of infantile blindness (Ophthalmia Neonatorum) over a period of about forty years, a high percentage of glaucoma, which is said to have become more prevalent since the World War, and an unexpectedly high figure for cases of blindness caused by infectious diseases, such as influenza, measles, scarlet fever, and diphtheria. It was stated, however, that these deductions could serve only as a broad indication of the position, and that in any subsequent survey the form in which the questions were cast would have to be revised in the light of the experience gained during the period under review.

It was for similar reasons that questions as to blindness were not asked in the census of Great Britain in 1921, and subsequently. Data as to blindness are obtained by the register kept under the Blind Persons Act, and a system is now widely, but, unfortunately, not completely, in force, under which no name is admitted to the register except on the certificate of an ophthalmic surgeon, who is asked to state the cause of blindness on the certificate.

We believe it is important that all statistical records should be based upon the report of specialists in ophthalmology, and that a common standard should be applied.

We find the same point emphasised by Professor R. Wilhelm Meisner, of Greifswald, in 1933, that for purposes of

research into the causes of blindness and the compilation of statistics "only records of ophthalmic surgeons are to be depended on. Even they meet with difficulties, as examinations taking place years after the beginning of blindness cannot always accurately establish the actual cause." It seems clear that, unless men of the widest experience undertake such work, very little information of real value will come to light, and we regard much of the data at present available as incomplete and not based upon sufficiently exact criteria to form the foundation for a precise scientific statement of the prevalence of the various causes of blindness.

20. For these reasons, at an early stage in our investigations, we issued an Interim Report on the Certification of Blindness and the Ascertainment of the Causes of Blindness, which was published in December, 1931. Briefly, we recommended (i.) that no one should be entered on the register of blind persons until he had been examined and certified to be blind by a medical practitioner with special experience in ophthalmology; (ii.) that the certification should be made on the form suggested by us, which, in addition to describing the existing condition of the eyes, should specify the cause of blindness under one or other of the headings set out in the classified list of the causes of blindness (*see* Appendix II.); (iii.) what the criteria of blindness should be; and (iv.) that copies of the forms, when completed, should be sent to us confidentially for examination and classification. Our indebtedness to the Scottish Authorities in the preparation of the form is referred to in the Report mentioned above.

We are glad to record that our Report on Certification, together with the form of Report and Certificate advocated by us (after certain agreed modifications had been incorporated), was made the subject of Circulars issued by the Ministry of Health (Circular 1353) and by the Board of Education (Circular 1431) on 5th October, 1933. The general adoption of the form of Report and Certificate was recommended by the Minister of Health and the President of the Board of Education for use by Local Authorities in England and Wales: (i.) in the examination of persons for admission to the Register of the Blind (Form B.D. 8 of the Ministry of Health); and (ii.) in the examination of school children (Form 37 D. of the Board of Education).

Both Circulars embodied the suggestion that, in order to provide means for the compilation of statistics of the causation of blindness, copies of the forms should be sent periodically to us, as the body authorised by the Ministry of Health and the Board of Education to collate statistics which should ultimately be of scientific value in the prevention of blindness, on the understanding that we would, in the words of Circular 1353, "be prepared to set up a Specialist Sub-Committee to examine and classify the information" con-

tained in the forms, and " with the approval of the Minister, to undertake, in consultation with any other specialist body (should this appear desirable), the tabulation of the statistics for the use of Local Authorities." Arrangements have accordingly been made for receiving copies of the forms at our office, and a Specialist Sub-Committee are engaged upon the examination and classification of the information so far placed at our disposal. When a sufficient number of the forms have been examined and classified, we shall be in a better position to draw sound deductions.

21. The Committee on Central Statistics of the Blind in the United States have been at work on a similar classification of causes for a considerable time, and have now evolved a schedule which is being made the subject of experiment in certain areas, with a view to recommending its adoption by the agencies responsible for the registration of blind persons in the various States. During the preparation of this schedule we have kept in constant touch with that Committee, and copies of our respective forms were exchanged.

In an article published in the *Outlook for the Blind* (the organ of the American Foundation for the Blind) in April, 1933, the Secretary to the American Committee on Statistics wrote: " The use of such a classification will greatly facilitate the preparation of comprehensive statistics of the causes of blindness, which have heretofore been of doubtful validity because of the lack of comparability in the methods of classification used by the different agencies. It is of interest to note that similar schemes have been developed in England and Scotland, and are being used there successfully. While the system here proposed differs in certain respects from the British classification, the differences are not so great as to prevent satisfactory comparison of results."

In Mr. Harry Best's valuable book, entitled *Blindness and the Blind in the United States* (published in 1934), very full statistics from American sources will be found, but the data are subject to reservations similar to those applying to the German Census of 1925-26.

22. Both the British and American classifications were forwarded to the International Association for the Prevention of Blindness for discussion at a meeting held in connection with the International Congress of Ophthalmology in Madrid in April, 1933. We are informed that the International Association have an international classification under consideration. We hope that the activities of the International Association will, as they extend, provide opportunities for strengthening, enlarging and co-ordinating the field of individual research. If they are successful in securing a comparable measure of uniformity in classification, invaluable results should be obtained.

## CHAPTER II.

# THE EYE IN HEALTH AND DISEASE.

23. The function of vision (the capacity to see) depends on the health and integrity of a series of structures whose combination forms the most delicate piece of mechanism in the human body. If any part of this mechanism is injured, or deteriorates, there is a consequent diminution in the power of seeing, and this may be so serious as to lead to blindness. The purpose of this chapter is to describe the structures concerned in the act of vision, and how those structures may be affected by disease or injury with consequent interference with their function.

24. The visual function can be roughly divided into three main components: (*a*) Physical; (*b*) Physiological; and (*c*) Psychological. The mechanism subserving the physical and physiological components lies in the eye and the nerve-tracts leading from the eye to the brain. The structures by which the stimuli resulting from rays of light reaching the retina are transformed into mental pictures lie in the brain. But before a true mental picture of an external object is formed, a number of stimuli from many other parts of the body, *e.g.*, the balancing mechanism lying in the inner ear, must also be received in the brain. The capacity of summing up, or integrating a whole series of stimuli from the two eyes and from various other organs and structures in the body is the final process in the act of seeing. (*See* Diagram I.)

## The Optical System of the Eye.

25. The function of the optical system of the eye (the dioptric mechanism) is to bring the rays of light to an exact focus on the sensitive screen (the retina) lying at the back of the eye. This mechanism is made up of a compound lens system consisting of the transparent cornea with a convex surface bounding a transparent fluid (the aqueous), then a diaphragm (the iris) which can vary by the action of its muscles the size of the pupil, and then a bi-convex lens whose substance is elastic and whose curvatures can be controlled and, consequently, its power varied by the activity of the ciliary muscle. It is by changes in the curvature of the lens surfaces that objects which lie at different distances can be brought to a focus at different times, and it is the diminution in the elasticity of the lens which, as age advances, leads to loss of capacity to vary these curvatures, and so gives rise to the well-known difficulty in reading which advancing

age brings. Behind the bi-convex lens lies a transparent jelly (the vitreous). If a clear picture is to be formed on the retina, the transmitting structures must be transparent, the curvatures true, and the position of the retina correct.

**Emmetropia.** (" Normal Sight.")

26. When one considers the delicacy of the mechanism and how small are the variations in curvatures or measurements of the globe and lens system which may upset the adjustment, it is astonishing to realise that the great majority of eyes so nearly reach, in the course of their development, the condition of normal sight which we call emmetropia. We call an eye emmetropic when, the focussing power being in abeyance, parallel rays of light reaching the eye are brought to a focus exactly on the retina. (In practice, it is assumed that rays emanating from 20 feet (6 metres) or any further distance, are parallel.) Departures from the normal can take place in either direction in an otherwise perfectly healthy eye. The eye may be too short, or the lens system too weak, in which case the rays will not have reached their focus when they arrive at the retina (hypermetropia). On the other hand, the eye may be too long or the lens system too strong, in which case the rays will have reached their focus and be already diverging when the retina is reached (myopia). In either case a blurred image results. It can be seen from what has been said, that there are several factors which may vary. The main factors are the length of the eye, refractive indices, the corneal curvature and the curvatures of the lens surfaces. There are subsidiary factors, but it might confuse the reader too much to enter into these. In the case of the healthy cornea it is only its radius of curvature that need be considered, since, owing to the parallelism of its surfaces, it need only be regarded as a limiting membrane to the aqueous. In the lens, however, the curvatures of both surfaces and the refractive indices of its parts may all vary. It is the perfect adjustment of these variable factors which, in the course of normal growth, produces an emmetropic eye.

**Hypermetropia.** (" Long Sight.")

27. In this form of defect parallel rays reaching the eye are not focussed when they reach the retina. Consequently, a point will not be presented on the retina as a point, but as a circular area (diffusion circle) whose size will be proportional to the forward displacement of the retina, and as a line is only a series of points, all lines will be correspondingly blurred.

This is the hypermetropic, or long-sighted eye. In this case a sharp focus can be obtained by the action of the ciliary muscles in increasing the lens curvatures. This is possible in youth, but, as age advances, the focussing power diminishes,

and it no longer remains possible. Even in youth the constant call on the very delicate ciliary muscle involves a strain and may cause headache, and may be a factor in producing styes and inflammation of the lid margins, and nervous exhaustion. This strain can be relieved by the use of appropriate convex glasses. (*See* Diagram II.)

**Myopia.** (" Short Sight.")

28. If the eyeball be too long, parallel light rays come to a focus in front of the retina, and the further back the retina is, the greater will be the size of the diffusion circles mentioned before, and the more blurred will the lines of a distant object appear.

When the lens of the eye is at rest, it is at its flattest curvature, and no activity can bring about any further diminution in its curves, or lower its refracting power. But if rays reaching the eye are diverging instead of being parallel, that is to say, if they are coming from objects relatively close to the eye, then the focus is further back and may coincide with the retina. Such an eye is able to read print at a very close range, and is said to be myopic, or short-sighted, but is unable to see clearly at a distance. By using suitable concave glasses, conditions can be restored to those that obtain in a normal eye, and parallel rays of light from a distant object may be made to diverge in the same degree as rays from a near object, and so be focussed on the retina.

Many myopic eyes are as healthy as emmetropic or hypermetropic eyes, but, unfortunately, some types of myopia exist of which this cannot be said, and it is one of the problems constantly presenting itself to an ophthalmic surgeon to determine whether a given myopic eye belongs to the class of maladjustment of the variables and is otherwise healthy, or to one of the types where the maladjustment is due to conditions affecting the general health and nutrition of the eye. If it be the latter type, the diseased condition, first manifesting itself as myopia, may ultimately lead to other and more serious ocular lesions which endanger the sight of the eye. Among the risks run by myopes of this second type are retinal damage and hæmorrhages, choroidal atrophy, and retinal detachment. Reference to these will be found in later parts of this chapter.

Up to the present little light has been thrown on the serious problem of differentiating the relatively safe from dangerous forms of myopia, though much good has been achieved by the study and treatment of children in the special classes for myopes which were started in London in 1908. Future research may establish criteria which may enable us to distinguish between the two forms, and this is one of the problems on which we recommend that further investigation should be undertaken.

Diagram I.

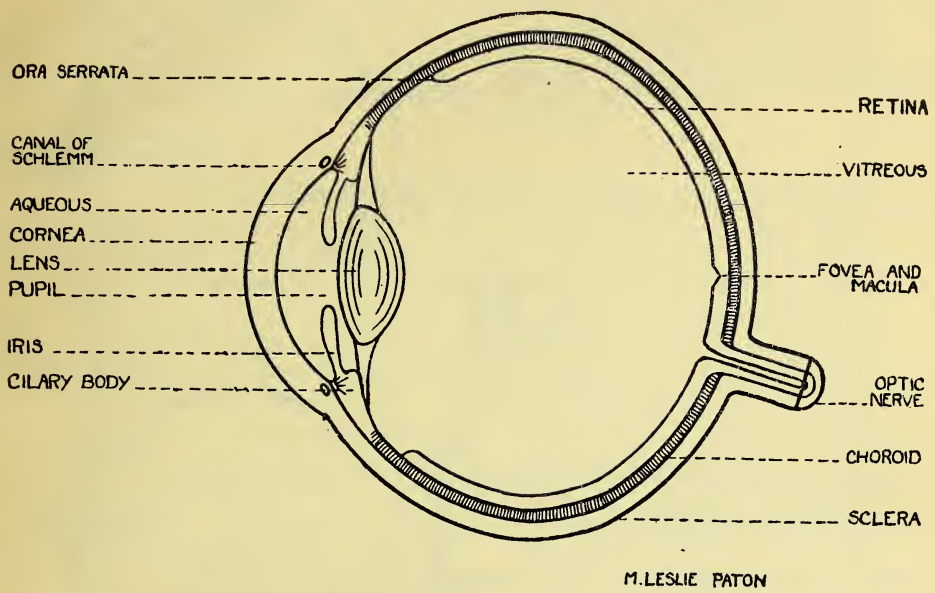



Diagram II.

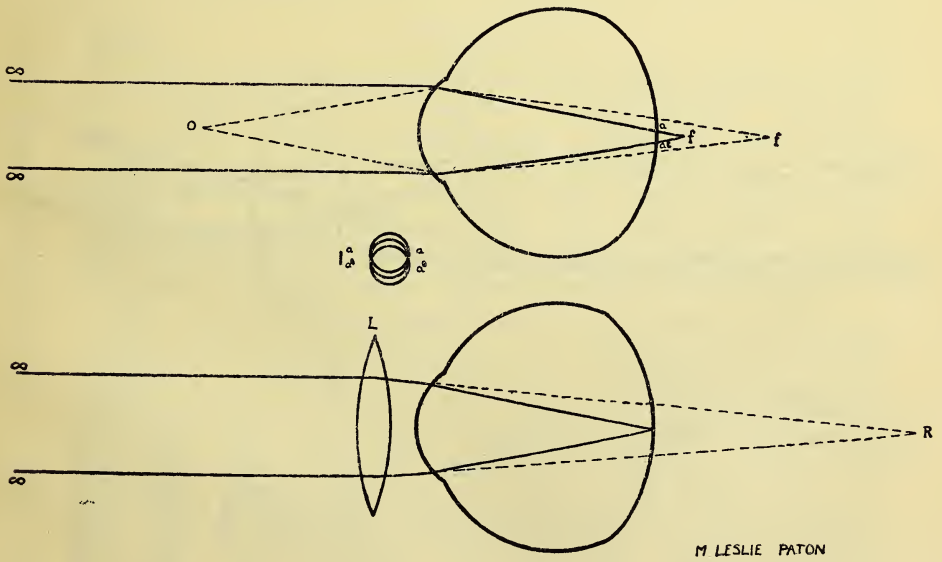
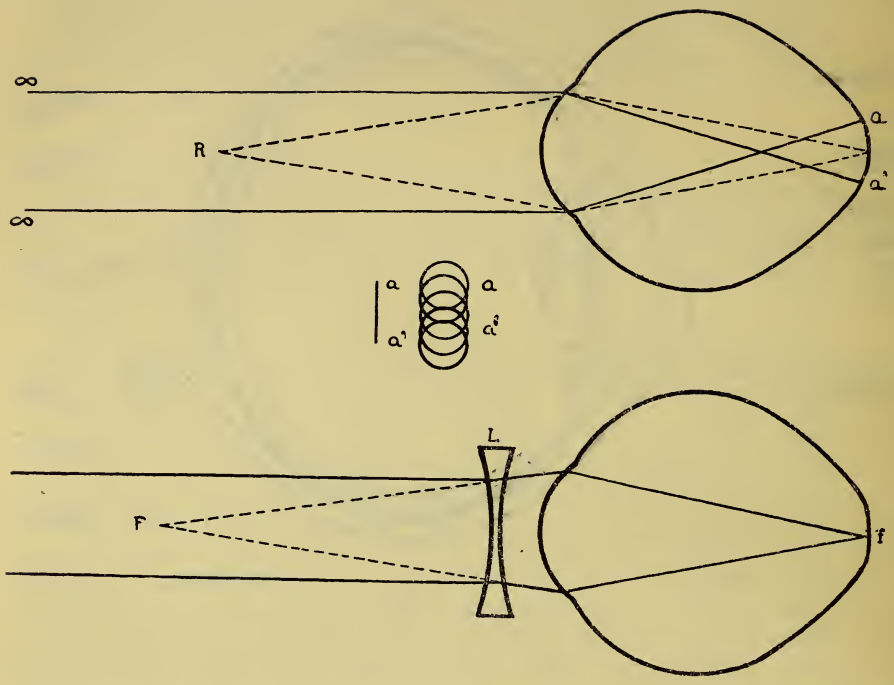
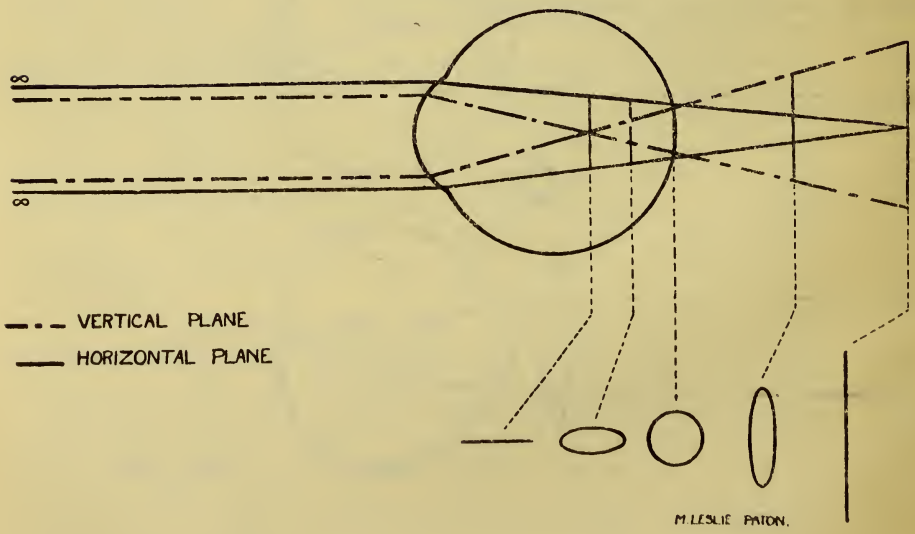


Diagram III.




M. LESLIE PATON

Diagram IV.




M. LESLIE PATON.

A study of myopia in its relation to the ophthalmic standards for the selection of children to attend special schools for the partially sighted is made in Chapter II of the Report of the Committee of Enquiry into Problems relating to Partially-Sighted Children (page 16). We agree with the standards laid down by that Committee. (*See* Diagram III.)

**Astigmatism.**

29. There is still another defect in which a blurred image results without any defect in the transparency of the media. When the curved surfaces of the cornea, or lens, are not true spheres, but are barrel-shaped, then the image of rays entering the eye in one plane, *e.g.*, in the direction of the barrel staves, will be brought to a focus at a different distance from those entering in a plane at right-angles to the first, *i.e.*, in the direction of the barrel hoops. This condition is known as astigmatism, and was first described in 1801 by Thomas Young. These faults in curvatures are mostly found in the cornea, and, as a rule, the horizontal curve of the cornea is flatter than the vertical. Astigmatism can be corrected by using a cylindrical lens to compensate the error. The axes of such a lens are not necessarily vertical and horizontal, but may be at any angle, though normally always at right-angles to one another. A point, as seen by an astigmatic eye, is never seen as a point, but may vary in shape according to the position of the retina, from a vertical line through a series of ovals, to a diffusion circle, and then through another series of ovals to a horizontal line. (*See* Diagram IV.)

**Squint.**

30. We cannot leave the subject of the optical system of the eye without reference to squint. Squint usually manifests itself before the age of three or four years, and is frequently associated with defective vision of the squinting eye. This defect (amblyopia), if not treated, precludes the subject from performing certain forms of work. The loss or injury of the sound eye may result in blindness, partial or complete. Squint may therefore be a cause of economic loss to the nation.

There are several theories about the causation of squint, no single one of which is sufficient to explain all cases of the condition. Perhaps the three most important factors in its production are: (1) defects of focus and excessive effort to get clear vision (hypermetropia); (2) defects of the muscles that move the eyes; and (3) inability of the brain to fuse the dissimilar images from the two eyes ("the fusion sense"). The truth probably lies in a combination of the three factors. The first factor depends upon the close relation between focussing and convergence. There is a natural link between these two which is not easily broken, so that, in the case of hypermetropes who, in contrast to emmetropes, require an

abnormal amount of focussing to get clear vision, an abnormal amount of convergence or a squint occurs. This theory explains why the proper wearing of glasses may cure a squint that has not become too habitual. The second and third factors explain the failure in some cases of glasses to have the desired effect.

In addition to the employment of glasses, the use of instruments to train and improve the proper physiological working of the squinting eye has been of value, and the clinics which undertake such training in hospitals (Orthoptic Clinics) have proved useful adjuncts to the usual forms of treatment. Whatever the treatment, it is essential that the squint and the amblyopia (sometimes referred to as amblyopia ex-anopsia) associated with it be treated as early as possible, and at latest, before the age of eight, and the widespread and dangerous tradition rife amongst parents that a squint, if left alone, will cure itself, should be strenuously opposed. The pity of it is that the idea contains a germ of truth in that some squints do automatically come straight without treatment, but the originally squinting eye, if of the amblyopic type, remains defective, and stereoscopic vision is in any case rarely present.

**Variations in Refraction due to Bodily Disorders.**

31. Note must be made of an important warning in regard to the examination of the eyes for the prescription of glasses. Conditions of bodily health and disease affect the eyes. To take only one example, in diabetes the refraction and therefore the focus of the eye may vary definitely from time to time, so that at one time a patient may be myopic and at another time hypermetropic. Often this state of affairs has led to the detection of an otherwise unsuspected diseased condition.

32. So far we have spoken only of defects in the optical mechanism where there is no loss of transparency in the structures concerned, defects which can, in most cases, be completely obviated by wearing suitable glasses, and which do not, in themselves, directly cause blindness, though they may lead to conditions which do cause blindness. We may now go on to consider the more usual ways in which the transparency of these media may be affected with a consequent deterioration of sight.

## The Conjunctiva.

**Ophthalmia Neonatorum.**

33. One of the most frequent causes of blindness in early life is inflammation of the membrane lining the lids and covering the white of the eye (the conjunctiva) due to infection

by virulent germs during birth. This inflammation may assume a very severe form and affect the cornea, causing ulceration and possibly perforation, and in some cases complete destruction of the eyeball. In any case where ulceration has taken place a scar is left resulting in an opacity, dense in proportion to the depth of the ulceration, and, in some cases, so dense as only to allow a dim perception of light. The condition is known as ophthalmia of the newborn (Ophthalmia Neonatorum).* The most frequent but by no means the only germ producing this condition is the gonococcus (*see* Chapter III., paragraph 72). The institution and spread of ante-natal centres should tend to reduce the likelihood of infection by securing treatment of the infected mother before the birth of the child, and indicating cases in which special precautions should be taken when treating the child's eyes at birth. Further, venereal disease clinics should tend to diminish the incidence of gonorrhœa, and so the transmission of this infection to babies' eyes. These clinics not only help to prevent the transmission of venereal disease to others, but also to cure venereal disease in the adult patients themselves, whose eyes in some cases may become infected with equally disastrous results.

**Trachoma.**

34. Trachoma has, from time immemorial, been one of the plagues of Egypt. It is said that nearly 90 per cent. of the fellaheen are infected. It is referred to in an inscription of the 4th Dynasty (the time of the Pyramids). It is probably the disease that made Leah tender-eyed, and there exists in a papyrus (the Ebers Papyrus) of the 18th Dynasty an elaborate account of the disease and its treatment. It is rife in Persia, Afghanistan, India, and China. Western Europe seems first to have been infected after Napoleon's invasion of Egypt. The remnants of Sir Ralph Abercrombie's expedition were so riddled with the disease that they were disbanded; these regiments were mainly Hessian and Irish, and each infected man became a focus for the dissemination of the disease. Owing to enforcement of the Aliens Immigration Act, cases are very infrequent in England, Scotland, and Wales. In trachoma, which is extremely contagious and essentially a dirt-disease, the under surface of the lids is primarily affected; sooner or later the cornea becomes involved, and a membrane containing blood vessels (pannus trachomatosus) grows over it. Much scarring of the conjunctiva and deformation of the lids is found in the later stages and ulceration with consequent scarring of the cornea. The disease is a very grave menace to sight. The treatment, to be efficacious, is painful and must be continued over very long periods. In consequence, patients often cease the treatment before a satisfactory cure can be obtained, the condition tends to relapse, and the chances of ultimate recovery are seriously jeopardised.

* The disease also occurs in adults as a result of direct infection.

## The Cornea.

### Interstitial Keratitis.

35. Syphilis—one form of venereal disease—may cause loss of transparency in the cornea. Children born of syphilitic parents are particularly liable to develop an inflammation in the substance of the cornea (interstitial keratitis) usually occurring between the ages of nine and fourteen. Such children may be deaf and may have very defective teeth. The three conditions, taken together, definitely indicate that the child has inherited syphilis (congenital syphilis). The opacity in the cornea may, in a few cases, be so dense as to interfere very seriously with the passage of light rays, and, as the condition of inflammation in front of the eye is frequently associated with inflammations in the deeper structures of the eye and consequent loss of sensibility in the retina, the blindness may become complete. Many cases, however, recover useful sight. Here, again, it is to be hoped that the intensification of the campaign against venereal disease and the more adequate treatment of syphilis in its early stages, when it can be cured, will be effective in reducing the number of cases of blindness from this cause. Acquired syphilis, as a cause of eye disease, is dealt with in subsequent sections of the Report.

### Small-pox.

36. It has been said that at one time more than 50 per cent. of the cases of blindness were due to small-pox, ulcers forming on the cornea causing subsequent opacity. This may still be true in Eastern countries, but in this country blindness due to small-pox is now almost unknown, and most ophthalmic surgeons have never seen a case.

### Phlyctenular Keratitis.

37. Another form of corneal disease requires mention—phlyctenular keratitis. Phlyctenular disease mainly occurs in delicate children of school age living in unsatisfactory home conditions. Many of these children have diseased tonsils and enlarged glands in their necks. Starting as a conjunctivitis, the bad cases develop ulcers of the cornea which frequently result in a great reduction of vision. As the ulcers spread and deepen, blood vessels make their way in from the edge (the limbus) of the cornea towards the ulcers, and gradually the surface of the cornea becomes dimmed by a membrane containing blood vessels (pannus eczematosus). Improvement in children's surroundings and early treatment, particularly in open-air schools, markedly reduce the ravages of this disease. The part borne by chronic tuberculosis and other (usually staphylococcal) infections in the causation of this disease is as yet obscure, but there seems to be little doubt that both these

and vitamin deficiency are factors. (*See* Report on Problems relating to Partially-Sighted Children, Chapter IV., Section E., pages 57 and 58.)

**Trauma.** (Injuries.)

38. Trauma plays an important part in the production of blindness at all ages. A difficult or protracted birth may cause injury to the cornea and opacities very damaging to sight; also hæmorrhages in the retina may occur. Pointed scissors in the hands of young children and fireworks or such dangerous toys as air-guns and darts in the hands of older children are always a source of danger. The slipping of a penknife, in cutting upwards the string of a parcel, has not infrequently caused serious injury to an eye. The knowledge that blindness may be caused by warfare has been too sadly brought home to us to require further comment.

In speaking of ophthalmia of the new-born, it has been mentioned that ulceration of the cornea resulted in opacities, and the deeper the ulcer the denser the opacity. Now any form of ulceration of the cornea may leave an opacity. An important cause of corneal ulcer is a neglected injury, and so it comes about that mechanical, chemical and thermal injuries causing destruction of the cornea result in blindness from corneal opacity. Mechanical injuries, especially in various forms of foundry work and engineering, chemical injuries from splashes of strong acids or alkalies, lime burns and heat burns may all result in blindness. Hence arises the importance of trying to teach men engaged in industries which may give rise to these types of injury the importance of using the various means of protection available, such as machine guards, goggles and gauze veils. (*See* Chapter IV.)

The agricultural labourer is very liable to suffer from eye injuries from various causes, and as these are often neglected, or inadequately treated, blindness may result in the injured eye. It is, perhaps, not generally realised that the rural worker under modern conditions has to be " Jack of all trades." He has to deal with machinery and chemical manures. He has to carry heavy loads of fodder on his back and take part in threshing operations, in both of which occupations he may encounter flying particles. He also runs a very great risk when plashing or trimming hedges. It may further be added that his occupation of necessity forces him to suffer exposure more than persons in other trades, and he may also be more remote from medical aid. (*See* Chapter IV.)

**Perforating Injuries.**

39. Perforating wounds of an eye are always a source of danger; any part of the eye may be irretrievably damaged by them or by severe blows. The former are not infrequently

accompanied by inflammation of the deeper parts of the eye (Irido-cyclitis), which in rare cases may be followed by a similar inflammation in the other eye (Sympathetic Ophthalmia) generally resulting in complete blindness of both eyes. How these changes in the originally injured eye can produce similar changes in the uninjured eye is not fully understood, but fortunately advances in ophthalmology, especially in the application of antiseptic and aseptic principles, have greatly reduced the incidence of sympathetic ophthalmia, as was amply proved in the Great War. It must still be reckoned with as a serious danger especially when a foreign body has perforated the eye and is retained within the globe or when what is known as the ciliary region has been affected. Children are peculiarly susceptible. The outlook in such cases is always serious, and it still seems necessary to emphasise the importance of removing immediately an eye which has been so seriously injured that there is no possibility of retaining any useful sight in it.

**Iritis and Irido-cyclitis.**

40. The iris may become inflamed from various causes giving rise to an exudation which by blocking the pupil causes blindness. The inflammation causes the iris to adhere to the surface of the lens and so blocks the free passage of the aqueous fluid from the place of its secretion (the ciliary body) to the front of the iris, and by bulging the iris forward may further block the passages by which the aqueous escapes from the eye. Exudate blocking the pupil may leave an opaque membrane after the inflammation subsides and so make the eye permanently blind. Blocking of the spaces by which the fluid escapes from the eye may result in a rise of pressure in the eye and so cause acute secondary glaucoma and consequent blindness.

Inflammation of the iris (iritis) occurs frequently in syphilis, both in congenital and acquired cases. It is a common result of a generalised infection from gonorrhœa, and has been known to occur many years after the original attack of gonorrhœa. Probably the most common cause is the presence of a septic focus elsewhere in the body. Some of the commoner sites of the primary septic focus are to be found in the teeth (pyorrhœa or apical abscesses), in the tonsils, in the air spaces communicating with the nose, or in the vagina. Behind the root of the iris lies the very vascular zone known as the "ciliary region," which includes the ciliary muscle. In most cases of iritis this region is also infected; the inflammation is then called an "irido-cyclitis," and its characteristics differ from the simpler and less serious types of iritis.

**Glaucoma.**

41. This is a condition where the pressure inside the globe of the eye is greater than normal. The outer coat of

the eye (sclera) may be considered as normally very resistant to distension. In health a continual renewal and elimination, or drainage, of the intra-ocular fluids is going on in such a way that, within narrow limits, the pressure inside the globe (intra-ocular pressure or tension) remains constant. Any interference with this delicately balanced mechanism results in an alteration of the intra-ocular tension, and, if equilibrium is not soon restored, finally leads to a deterioration of the eye. In glaucoma, continued unrelieved increase of tension ends in the delicate nerve fibres being crushed to death. Glaucoma is responsible for many cases of blindness. There are two main types, primary and secondary.

*Primary Glaucoma* is, again, sub-divided into chronic, sub-acute, and acute. The chronic form may persist insidiously for years and then suddenly be followed by an acute attack, or there may be sub-acute attacks characterised by temporary blurring of vision and the appearance of coloured haloes round lights, and these may recur at intervals over a long period to be ultimately followed by an acute attack. In the chronic form the degeneration of the nerve goes on insidiously with gradual but characteristic loss of the visual fields and cupping of the optic nerve head, but no pain. It may be kept in check by the use of drugs, such as eserine or pilocarpine, which diminish the size of the pupil and lower the intra-ocular tension, or operation may inhibit the progress of the degeneration. Sub-acute attacks always demand operation as they are almost invariably precursors of an acute attack. Acute glaucoma is one of the most painful diseases from which human beings can suffer. The pain radiates all over the head and side of the face, and is frequently accompanied by vomiting. The eye becomes of a stony hardness from the increase of pressure within it. Sight may be so affected that not even bright lights can be seen, and if the pressure is not speedily relieved, the loss of sight becomes permanent. Immediate operation is called for not only for the relief of suffering but in the hope of procuring some restoration of vision.

A peculiar form of glaucoma is met with in infancy due to mal-development of the drainage system of the eye. It gives rise to a general stretching of the coats of the eye, and owing to the large size of the cornea it is called "Buphthalmia."

Glaucoma is a disease which in its chronic form proceeds so insidiously that it may pass unnoticed for years unless the eyes are properly examined. The patient may think it is only a question of buying stronger glasses, and may find a temporary improvement in sight by doing so, but in the meantime the field of vision may be slowly contracting (the central sight remaining very little affected), and the more contracted it is the less hope there is that subsequent operation may

delay the progress of the disease. It may be said to be the most serious form of eye disease in late adult life and old age.

*Secondary Glaucoma* is a rise of tension occurring as a result of some other ocular disease, *e.g.*, as a complication of iritis, where, as a result of inflammation (*see* paragraph 40) that part of the eye lying behind the iris where the intra-ocular fluid originates, may be shut off from the anterior chamber where the drainage takes place.

## The Lens.

**Cataract.**

42. Behind the iris lies the lens, and it is loss in the transparency of the lens which is the most frequent cause of serious impairment of vision in old age. It is also a not infrequent cause of defective vision in childhood. The normal healthy lens is built up of fibres compressed into a homogeneous and transparent structure. Under certain conditions the nutrition of the lens suffers and the fibres composing it shrink, break up and lose their transparency. To use a simple analogy—a piece of glass may be perfectly transparent, allowing light to pass through freely, but if the same piece is broken up into powder, the powder is quite opaque because now the light is reflected from the numerous little surfaces of the broken glass in every direction. The condition resulting from the shrinking of the lens fibres and the appearance of fluid bubbles between them is the commonest form of cataract. In a form of cataract occurring in early childhood known as "lamellar or zonular cataract," the central part of the lens is clear; surrounding this is a zone of opaque lens fibres, which, in their turn, are surrounded by clear fibres. This condition is commonly associated with a defective formation of the enamel of the permanent teeth resulting in many cases in horizontal groovings in certain of the teeth of the second dentition, and not infrequently there is a history of infantile convulsions. Malnutrition or serious illness of the mother during the early and middle months of pregnancy, when the lens fibres are being laid down round the embryonic nucleus, may play a part in producing many forms of congenital cataract. Here, again, is exemplified the importance of pre-natal clinics in the treatment of the mother.

Fortunately, in most cases of cataract the operation for its removal results in the restoration of good vision, in the absence of other defects. Infants bear the operation well; age is no bar, and successful restoration of vision has taken place after operation in patients over 90 years of age. A great number of people over 60 years of age show traces of opacity in their lenses. Only in a very few, however, do these traces develop into an opacity of such extent as to justify the use of the word "cataract," and it is unfortunate that the word is

applied where there are only slight striæ of opacity which are never likely to develop into a condition which will seriously interfere with sight. It is very desirable that in these cases the use of the word cataract should be avoided. This would save much unnecessary distress to old people who, when the word cataract is used in their hearing, immediately picture to themselves a rapid onset of blindness. Secondary cataracts may occur as a complication of many forms of eye disease.

**Industrial Cataract.**

43. A form of cataract occurring in glass-blowers, tin-plate rollers, and other iron workers, affords an example of an industrial disease due to radiant energy. Disturbance of lens nutrition occurs, a slow process taking many years of exposure to the rays before the cataract interferes seriously with the men's work. (*See* Chapter IV., paragraph 123.)

## The Vitreous.

44. The transparent jelly which fills the chamber of the eye behind the lens requires only a very short reference in passing. Occasionally a copious bleeding into it may result in blindness. This bleeding is not necessarily the result of any injury. One form of it occurs in young men seemingly otherwise in perfect health. Some recovery of vision may take place with absorption of the blood, but often the recovery is very partial. In myopes the consistency of the vitreous may change, and from being a true jelly, may become fluid. This change in the consistency of the vitreous is one of the factors in detachment of the retina. In cyclitis and choroiditis the vitreous may become very hazy and show large floating veils of opacity, very seriously interfering with the transmission of light rays.

## The Retina and Choroid.

45. So far we have dealt with the transmitting media (the dioptric mechanism) and the blindness resulting from interference with the passage of light through them. When the light reaches the retina and is clearly focussed on it, the problem becomes mainly physiological. If the sensitive screen, the retina, is in a healthy condition, the light rays falling on it set up nerve impulses, which are transmitted by the optic nerve fibres to the higher brain centres. One physiological point of importance to those engaged in investigating blindness must, however, first of all, be dealt with. The sensitivity of the central part of the retina (the macula), that is, the area of most accurate discrimination, differs from the sensitivity of the more peripheral parts of the retina. The sensitivity of the central part (macular vision) is at its greatest

in eyes that have been in full daylight for a short time (photopic or light-adapted eyes). In darkness the sensitivity of this part of the eye sinks almost to nothing and the sensitivity of the surrounding area is much increased (the scotopic or dark-adapted eye) although it takes some little time for full dark adaptation to take place. In retinal atrophies, *e.g.*, retinitis pigmentosa, the peripheral retina degenerates and this power of dark adaptation is lost, and so, though such patients may see fairly well in full daylight, they become practically blind in dim light. Conversely, in diseases affecting the macular area of the retina, *e.g.*, tobacco blindness and other toxic amblyopias, senile macular degeneration, and various forms of central retinitis, vision may be bad in full daylight and yet, in very dim lights the sight of such patients may be little worse than that of normal people. Equally, the colour sensitivity is greatest centrally and falls off to the periphery. The macula is sensitive to all colours; beyond this is a zone which is sensitive only to blue and yellow and beyond that a zone in which there is no colour perception.

46. Only a few of the more important diseases of the retina which lead to blindness can be mentioned here.

The two commonest forms of macular degeneration leading to loss of central vision and of ability to read are the myopic type and the senile type. Myopia as a cause of blindness has been discussed in an earlier paragraph (paragraph 28). Senile macular degeneration progresses very slowly, and may remain restricted to one eye for a long time, but in many cases ultimately both eyes are affected. Peripheral vision is usually unaffected so that the patient can walk about freely.

The walls of the blood vessels frequently degenerate with advancing years or as a result of kidney disease, syphilis or toxic agencies. This degeneration may lead to many conditions, any one of which may result in blindness. Most cases of sudden blindness are vascular in origin. When the blood pressure rises, large hæmorrhages may occur in the retina. A clot may form in the main vein leaving the eye in the centre of the optic nerve (thrombosis of the central vein), or an embolus may lodge in the central artery or a thrombus form in it (embolism or thrombosis of the central artery).

The condition of the blood vessels of the retina, as revealed to the ophthalmic surgeon by ophthalmoscopic examination, has an importance quite apart from the local dangers that may arise from their disease. Nowhere else in the body can the arteries and veins be actually seen, and in the diagnosis of many general diseases the information that can thus be gained is of the greatest importance. Often the first signs of disease are revealed by an inspection of the condition of the back of the eye. Diseases of the kidney, diabetes, scurvy, and other blood diseases are so revealed. Cerebral tumours and other

diseases of the central nervous system are often most surely indicated by the alterations they produce in the fundus of the eye.

A further example of the way in which the health of the eye shares that of the body generally is seen in the toxæmia of pregnancy. In some pregnancies " cytotoxins " seem to be elaborated which can prejudicially affect more especially the renal and retinal tissues. A water-logging (œdema) of the retina is produced which seriously interferes with its perceptive properties, shown by failure in reading sight. A similar œdema behind the retina may lift it from its bed and cause a detachment. If the pregnancy be promptly terminated, the œdema may clear up, and it is often necessary to advise that this should be done to save the mother's sight.

47. Certain hereditary or familial degenerations affect the macula. An important familial disease is cerebro-macular degeneration. This is usually sub-divided into two main types, but there is some evidence pointing to the existence of a third type. The first type (amaurotic family idiocy) is restricted almost entirely to Jewish children. It commences in early infancy, and the children all die blind before the age of two. The second, or juvenile, type usually begins at the age of secondary dentition and is slower in its progress. The blindness is associated with a form of paralysis (spastic) and increasing imbecility, but the children may live to the age of 16 or 17 as hopelessly paralysed blind imbeciles. A somewhat similar disease commencing at puberty and leading to very defective sight, but showing a much slighter degree of mental and physical degeneration, may fall within this category. There are other rarer diseases of a similar nature which need not be mentioned in detail here.

48. Certain diseases beginning in the more peripheral areas of the retina cause blindness. In the first place is a well-known form of hereditary or familial disease, in which the retina atrophies (retinitis pigmentosa). This is responsible for a large number of cases of blindness. The blindness at first affects the peripheral parts of the field of vision and central vision may persist for many years. The degeneration usually sets in in early adult life, and may be accompanied by other evidence of nerve degeneration (epileptic attacks, deafness, etc.). Numerous family trees showing the inheritance of these retinal atrophies through many generations are given in detail in Miss Julia Bell's most valuable *Nettleship Memorial Volumes*. An allied diease which does not give rise to any visual defect in day-time is familial or stationary night-blindness. In the Nougaret family there are records of nine generations in which 135 individuals were affected out of approximately 2,000. Another cause of retinal atrophy is disease of the choroid. This coat is composed almost entirely

of blood vessels and is the main source of nutrition for the retina, especially its rod and cone layer (the most sensitive part). Hence inflammation of the choroid may cause degeneration of the retina by damaging its nutrition.

49. Detachment of the retina, with resultant loss of sight, occurs when the retina balloons away from its proper position. It is especially liable to occur in myopic eyes in which there is also a tendency to hæmorrhage and degenerative changes in the retina at the back of the eye, involving the destruction of the minute highly specialised area (the macula), which alone can give precise direct vision. All these catastrophes tend to ultimate blindness. In recent years an operation which will replace a detached retina in favourable cases has been evolved, but previous to this important advance in surgery, the outlook was practically hopeless.

## Intra-ocular Tumours.

50. Though intra-ocular tumours, benign and malignant, are infrequent, all constitute an extremely grave threat to sight, and, when malignant, to life itself. Two varieties of malignant tumour are recognised: (1) Glioma of the retina, a rare malignant tumour found in infants under six years of age. The condition may cause an alteration in the appearance of the pupil which shines like a cat's eye, and may be bi-lateral. The growth tends to spread to the brain and other parts of the body, and in this way causes death. It is possible that glioma may be a familial disease, but at present sufficiently reliable statistics are not available: (2) Sarcoma of the choroid occurring usually after 45, in later stages giving rise to secondary deposits in different parts of the body resulting in death.

Tumours originate in such places that only skilled observers can detect them in the earlier stages. It is very important for the preservation of life that these cases of intra-ocular tumour should be recognised in their early stages, but this can only be done by careful and practised examination.

## Optic Nerve Atrophy.

51. A large percentage of cases of blindness is due to the atrophy of the nerve fibres of the optic nerve. Atrophy can be the result of many different causes, and in the limited space at our disposal it is only possible to give a general indication of the ways in which it occurs. The optic nerve differs from an ordinary nerve in being an integral part of the brain, just as the sensitive portion of the eye, the retina, is an out-growth of the brain. The optic disc (papilla) is the area at the back of the eye where the nerve fibres from the whole retina are gathered together to form the optic nerve and leave the eye. In health it is a clearly outlined disc with the central artery and veins in a pit in the centre.

The optic nerve reacts to disease like the rest of the central nervous system, and is subject to the same diseases as the rest of the conducting fibres of the central nervous system. The main bulk of the fibres composing it arise from cells lying in the retina, and depend for their health and integrity on the vitality of these (ganglion) cells. If they are injured, or die, or if their connection with the nerve fibres is blocked in any way, the fibres atrophy. Hence the first type of optic atrophy is that which follows on retinal inflammations and degenerations. The retinal inflammations which involve the optic nerve head can be classified under the heading of neuro-retinitis, but besides these there are various forms of retinal degeneration which give rise to atrophy of the optic nerve. In the second type of atrophy the nerve itself is affected, either at its entrance into the eye, or in its course between the brain and the eye. Under this heading come (*a*) glaucoma—a condition which has been already dealt with (*see* page 21)—and (*b*) optic neuritis.

**Optic Neuritis.**

52. Under the generic name "Optic Neuritis" is included a variety of conditions, some of which affect the portion of the nerve as it enters the eye (optic disc or papilla) (papillœdema and papillitis); others primarily affect the nerve behind the eye (retro-bulbar neuritis). Only when the nerve fibres atrophy does the optic disc show atrophic changes.

(a) *Papillœdema.* This condition is the result of an accumulation of non-inflammatory fluid (œdema) in the papilla often causing very considerable swelling. It is most frequently seen in cases of tumour of the brain where the great increase of intra-cranial pressure is transmitted down the nerve sheaths and causes a block in both the venous return and the lymph return from the nerve head. Vision may remain unaffected in many of these cases for quite a long time, but if the pressure is unrelieved, ultimately degeneration of the nerve fibres sets in and atrophy results. For this reason early operation is desirable, and it is also to be borne in mind that cases diagnosed as cerebral tumour are not necessarily fatal.

(b) *Papillitis.* In this condition the nerve head is again œdematous, but an inflammatory process is present also, and the swelling of the nerve head is only a manifestation of a true inflammation of the optic nerve in which the anterior portion of the nerve is affected. In cases where the intra-cranial pressure is raised from inflammatory causes, the inflammation, as well as the pressure, may be transmitted down the nerve sheaths, *e.g.*, cerebral abscesses or meningitis.

(c) *Retro-bulbar Neuritis.* If the nerve head is not involved in the inflammation and only the portion of the optic nerve behind the disc is affected, it cannot be submitted to direct observation, and inflammation in and injury to it must be

inferred from the signs and symptoms produced. Central vision is affected, there is usually pain and the pupil reactions are affected. This retro-bulbar neuritis may result from many causes, some local, in which there may be complete recovery of sight. In others, and these the more important, the neuritis is only a manifestation of diseases of the central nervous system, such as tabes, general paralysis of the insane, disseminated sclerosis, and other forms of myelitis. Tabes and general paralysis of the insane are syphilitic in origin and, as syphilis is curable if discovered and treated in time, blindness due to these causes is, to that extent, preventable.

53. Optic atrophy may also result from injury to the nerve in fractures of the base of the skull or from pressure on the nerve in the orbit, and in some cases from tumours which press directly on the optic nerve trunks inside the skull with no preceding papillœdema. Optic atrophy may follow the injudicious use of certain drugs such as quinine and some of the arsenical compounds. (*See* page 60.)

## Visual Paths in the Brain.

54. On reaching the base of the brain the two optic nerves meet and split, *i.e.*, one-half of one nerve joins up with the opposite half of the other, and so two tracts are formed, one going to the right side of the brain and one to the left side. Injury to either of these tracts will result in half blindness (hemianopia), *i.e.*, each eye will be blind on the same side. If the left tract is injured the blindness will be to the right side in both eyes, and the patient will see objects to his left as usual. If both tracts are injured the blindness will affect both sides.

Through various relays from the retina *via* the optic nerves and tracts messages ultimately reach the posterior part of the brain where the vision centre lies. If this portion of the brain is injured, or destroyed, vision is affected in a degree proportional to the amount of injury. For vision to be effective and give rise to a complete mental picture of the size, shape, colour and position of an object in the outer world, the communications of this part of the brain with various other parts must be uninterrupted and functioning properly. As mentioned in the introductory paragraph, the brain must receive a number of impressions beyond those from the eye itself before it can build up an accurate percept. The images from the two eyes are not exactly similar, and the summing-up of these two dissimilar images in the brain helps us to judge the solidity of the object and its position in space relative to ourselves. The condition of contraction or relaxation of the eye muscles is telegraphed to the brain and tells us whether an object is to our right or left, or above or below. The position of the

head in space is another factor of great importance, and this information comes from a part of the inner ear called the "labyrinth." Furthermore, the position of the head relative to the rest of the body has to be registered in the brain, and this is determined by the state of contraction or relaxation of the muscles of the head or neck. It is the function of higher brain centres to integrate these various stimuli constantly coming in from different sources, and only then is the act of seeing complete.

## Classification of Diseases.

55. We have considered above many of the diseases which cause blindness or reduction in vision. It may be helpful to take the Examination Report and Certificate of Blindness (Form B.D. 8) (*see* Appendix II.), and give cross-references to the foregoing paragraphs.

On the first page of the Form appear details of the physical examination, on the second page the causes of these physical defects, and on the third page a summary of the defects and causes. On the fourth page is the actual Certificate of Blindness.

The second page is the one that concerns us here. An attempt has been made to arrive at a pathological classification of causes. After due consideration of the classifications in this country and elsewhere, it was felt that the classification suggested by this Committee and adopted by the Ministry of Health in their Form of Certificate (B.D. 8), held most promise of arriving at useful conclusions. The object is to draw a distinction between the ascertained condition of each eye as shown on page 1 of the Form, and the cause of such condition as shown on page 2. For instance, no reference will be found in the Form to "optic atrophy." A record of "optic atrophy" alone, without indicating which of the many and different causes is involved, is valueless in determining what steps should be taken to reduce the amount of blindness from this disease. In such a case, on page 1, the word "atrophy" will appear opposite "optic nerve," and on the second page a tick or mark against "congenital" or "meningitis," etc., according to the genesis of the atrophy.

56. The following references will provide illustrations of many of the conditions enumerated on page 2 of the Form:—

**A.—Congenital and Developmental Causes.**

1. Congenital, hereditary and developmental defects. References are found to lamellar cataract on page 22. Retinitis Pigmentosa, page 25. Cerebro-macular degeneration, page 25. Buphthalmia, page 21.
2. Myopic errors, page 14.
3. Other errors of refraction, pages 13, 15 and 16.

4. Primary Glaucoma, page 21.
5. Primary Cataract, page 22.
6. Detachment of Retina, pages 14 and 26.
7 and 8. Tumours, page 26.
9. Amblyopia ex Anopsia, page 16.

**B.—Infectious and Bacterial.**

1. Ophthalmia Neonatorum, page 16.
2. Gonorrhœa, pages 17 and 20.
3. Syphilis, pages 18, 20 and 28.
4. Trachoma, page 17.
5. Local infections of coats of the eye, page 20.
6. Small-pox, page 18.
7. Meningitis, page 27.
8. Tuberculosis, page 18.
9. Eczematous Kerato-conjunctivitis, page 18.
10. Acute Septicæmia.
11. Septicæmia chronic, Auto-intoxication, Focal Sepsis, page 20.
12. Other infections and bacterial diseases, page 18.

**C.—Traumatic and Chemical.**

1. Industrial—
   - (*a*) Trauma, page 19.
   - (*b*) Disease, page 23.
2. Non-Industrial—
   - (*a*) Trauma, page 19.
   - (*b*) Systemic Poisoning.
   - (*c*) Birth Trauma, page 19.
   - (*d*) War Trauma, page 20.
3. Indirect: Sympathetic Ophthalmia, page 20.

**D.—General Diseases.**

1. Anæmia.
2. Vascular, page 24.
3. Of central nervous system, pages 27 and 28.
4. Connected with childbirth, page 25.
5. Brain Tumours, page 27.
6. Diabetes, page 24.
7. Nephritis, page 24.
8. Other general diseases, page 24.

**E.—No Information Obtainable.**

## The Age-Incidence of Certain Eye Diseases.

57. It should be realised that few diseases are invariably associated with any particular age, as race, heredity, climate, employment and other factors often have a determining influence. While many diseases may commence at any age and resolve under treatment, some, once established, may be prolonged throughout the remainder of the patient's lifetime. Only a rough classification with certain illustrative diseases will therefore be attempted:—

**1. Infancy to School Age.**

Congenital anomalies (including cataract, albinism, aniridia).
Birth injuries.
Infantile Cataract.
Conjunctivitis (including Ophthalmia Neonatorum).
Buphthalmia.
Glioma.
Squint (including Amblyopia).

**2. School Age.**

Blepharitis.
Conjunctivitis (including Phlyctenular disease).
Trachoma.
Interstitial Keratitis.
Myopia, Complications of,
Specific Fevers, Complications of,
Squint (including Amblyopia).
Infantile Cataract.
Buphthalmia.

**3. Adult Life.**

Conjunctivitis.
Detachment of Retina.
Glaucoma.
Diabetes.
Renal disease.
Vascular disease.
Industrial disease and injury.
Intraocular Tumour.
Iritis.
Tobacco and other Toxic Amblyopias.
Myopia, Complications of,
Optic Atrophy.
Trachoma.

**4. Old Age.**

Cataract.
Glaucoma.
Conjunctivitis (including Pemphigus).
Corneal Dystrophies.
Diabetes.
Renal disease.
Vascular disease.
Intra- and Extra-ocular Tumours.
Iritis.
Tobacco and other Toxic Amblyopias.
Myopia, Complications of,
Optic Atrophy.
Senile Degeneration of Retina and Choroid.
Trachoma.

Sympathetic Ophthalmia may occur at any age.

## CHAPTER III.

# ASCERTAINMENT AND TREATMENT OF EYE CONDITIONS.

58. We turn now to problems of administration in their relation to the ascertainment and treatment of eye conditions or diseases which may lead to eventual loss of vision, and to the efforts that have been made for their prevention. In the first place we give an account of the facilities which are being utilised for this purpose throughout England and Wales. A series of questions was drawn up relating to the measures already taken by Local Authorities for the preservation of sight and the prevention of blindness. Some of the questions could be answered without application to individual Authorities, but in the greater number it was considered advisable to make our enquiries personally. This was done by our Secretary, who visited nearly every County and County Borough Council on our behalf. The information from Authorities (other than the Councils of Counties and County Boroughs) responsible for Maternity and Child Welfare and Elementary Education respectively was obtained by correspondence. We should like to take this opportunity of expressing our gratitude to Medical Officers of Health and other officers of Local Authorities for their courteous and ready assistance.

59. The data collected under the headings given in Appendix IV. have been analysed and form the basis upon which the conclusions in this chapter have been drawn. We now propose to discuss the various aspects of our investigation, which are divided into sections on a basis of age and which fall conveniently under the following heads:—

Ante Natal: Examination, supervision and treatment of the expectant mother.

Infancy: Measures taken to prevent blindness in children under one year of age.

Pre-School: Preventive measures as applied to children between 1 and 5 years of age.

School Age: Ascertainment and treatment of eye diseases in children between 5 and 14 years of age.

Adolescence and Adult Life.

## Ante-Natal.

60. Under this heading we must consider those conditions which are likely to have an adverse influence in the ante-natal stage. Of these, venereal diseases constitute the greatest menace to eyesight, and it is therefore of the first importance, from the point of view of the prevention of blindness, that their presence in the mother should be detected as early as possible and the requisite treatment carried out.

61. There are schemes for ante-natal work in almost every area, although many of these schemes are incomplete. In the areas of several large rural Authorities ante-natal clinics are reinforced by a scheme of examination by general practitioners, either at their surgeries or in the home of the patient, and in one of these areas it is recorded that for every 10 women examined at a clinic 100 are examined privately under the scheme. The majority of Maternity and Child Welfare Authorities have developed schemes for ante-natal examination and many have facilities for any necessary treatment. Many Authorities systematically refer cases needing treatment to Maternity Hospitals or Venereal Disease Clinics. A good deal of work remains to be done in persuading women to make full use of ante-natal clinics. The percentage of women attending ante-natal clinics or centres to the total notified births has reached, in some areas, the comparatively high figure of 70 per cent., but is sometimes lower than 4 per cent. The average figure, however, gives an encouraging indication of progress. We find, on consulting the Annual Report of the Chief Medical Officer of the Ministry of Health for 1933 and 1934, that, whereas in 1930 the number of women attending ante-natal clinics in England expressed as a percentage of total notified births (including still-births) was 27·3 per cent. in 1934 it had risen to 43·1 per cent.

62. We appreciate that the primary object in the development of ante-natal work is to secure a reduction in maternal and infant mortality, but from the point of view of preventing blindness, we cannot overrate the importance of a comprehensive and adequate system of ante-natal supervision as a means of safeguarding the eyesight of both mother and child. Apart from the conditions mentioned in the preceding paragraphs 59 and 60, we wish specially to emphasise that failure of reading sight during pregnancy calls for expert examination of the fundus, as it may be a symptom of toxæmic retinitis. The presence of albumen in the urine is also a reason for the examination of the fundus, as it may be associated with serious retinal changes. (*See* Chapter II., paragraph 46.) Ante-natal examination may also reveal that subsequent labour may be attended with so much difficulty as to endanger the child's sight, and means should be taken to avoid this risk (*see* paragraph 84.)

63. The development of ante-natal services and of the means of securing early treatment in cases where venereal disease is present or suspected, should do much to secure for the new-born child a greater measure of immunity than formerly from the diseases or infections which threaten eyesight in the early days of life.

The Annual Report of the Chief Medical Officer of the Ministry of Health for 1932 referred to the special arrangements made "at a number of Maternity and Child Welfare Centres for the diagnosis and treatment of gonorrhœa and syphilis in their patients," and emphasised the value of ante-natal treatment in the prevention of gonorrheal ophthalmia and congenital syphilis, and the Annual Report for 1933 recorded that "a number of Local Authorities have not yet given serious consideration to the co-ordination of ante-natal work with that for venereal disease." We hope that the importance of arranging and maintaining close liaison between the ante-natal work of an authority and the centres or clinics for the treatment of venereal disease will become generally realised as time goes on. We recognise, however, the difficulties of establishing a satisfactory link between the Maternity and Child Welfare Department and the Venereal Disease Department in areas where the population is scattered and where the only available treatment centre for venereal disease is a considerable distance away, but we consider that no effort should be spared in arranging for adequate ante-natal supervision and providing the best treatment possible in the circumstances. An examination of the various methods employed by Public Health Authorities has led us to the conclusion that where it is possible to arrange for women and children to receive treatment for venereal disease at a clinic in association with a Maternity and Child Welfare Clinic, rather than at the recognised venereal disease centre, such an arrangement is desirable, and its success has been demonstrated by a far greater willingness on the part of the patient to make the necessary attendances. The Ministry of Health recommend the provision of treatment on such lines in their Circular 1474, issued 9th April, 1935.

## Infancy.

64. This section is concerned with the child in the first year of life, and more especially with the child in the earliest stage of infancy, when conditions present at, or shortly after, birth may seriously threaten sight; of these the most important are the infections and injuries that may occur at birth itself.

65. In the provinces the machinery for dealing with the infant and young child is the organisation of Maternity and Child Welfare Schemes. These schemes are carried out in England and Wales by the Councils of each of the 62 Counties

(other than the London County Council) and 83 County Boroughs, and by the Councils of 143 non-County Boroughs, 108 Urban Districts, and 11 Rural Districts. In London schemes are carried out by each of the 29 Metropolitan Borough Councils. The London County Council, though not a Maternity and Child Welfare Authority, incur expense in respect of certain services, including the provision of institutional treatment of Ophthalmia Neonatorum. (*See* paragraph 75.)

**Ophthalmia Neonatorum.**

66. The register of blind persons and investigation into the causation of blindness in children in special schools for the blind supply us with some indication of the amount of blindness attributable during the last half-century to the form of ophthalmia known as "Ophthalmia Neonatorum." The compulsory notification of Ophthalmia Neonatorum necessitated the setting up of machinery to deal with it, and we have endeavoured in the following pages to give some account of the way in which the ascertainment and treatment of cases of Ophthalmia Neonatorum is carried out in England and Wales. (*See also* Appendices V. and VI.)

67. Since the publication of the Departmental Committee's Report on the Causes and Prevention of Blindness in 1922, a revision of the Public Health (Ophthalmia Neonatorum) Regulations, 1914, has taken place. Whereas under the General Order, 1914, the duty of notification of a case of Ophthalmia Neonatorum was laid upon every certified midwife, unless the case had already been notified by a medical practitioner, in 1926 amended Regulations were issued (with Circulars 617 and 617A) by the Minister of Health, under which the duty of notifying a case of Ophthalmia Neonatorum is placed solely upon the medical practitioner in attendance upon the case. At the same time an obligation is laid upon the Medical Officer of a Local Sanitary Authority, other than a County Borough, to forward a copy of every notification of Ophthalmia Neonatorum received by him to the County Medical Officer within 24 hours of its receipt.

The procedure, therefore, under the 1926 amended Regulations normally takes the following course. A midwife, under the Rules of the Central Midwives Board, is required to summon medical assistance for a case of "any inflammation of, or discharge from, the eyes, however slight" occurring in her practice. In order to carry out this requirement she must fill in a form known as a "medical-aid notice," and, at the same time, send a copy of this notice to the Local Supervising Authority in order to acquaint them with the fact that such assistance has been sought. The duty of *notifying* a case of Ophthalmia Neonatorum to the Local Sanitary Authority devolves solely upon the medical practitioner, whether he has been summoned on a "medical-aid notice" or is ordinarily

in professional attendance on the case. Circular 617A notes that in some instances the previous system of dual notification by medical practitioners and midwives resulted in complete failure to notify, and it was this unsatisfactory state of affairs which the amended Regulations sought to remedy.

68. In general, the Councils of Counties (including London) and of County Boroughs are the Local Supervising Authorities under the Midwives Acts, but the functions of these authorities may be transferred, by an Order of the Minister of Health, to the Council of any district which has established a Maternity and Child Welfare Committee, and which employs a Medical Officer of Health who is restricted from engaging in private practice; such orders have been made in the case of thirty Non-County Boroughs and Urban Districts. It will be noted therefore that in the case of County Districts the Local Supervising Authority, to whom the midwife has to report, is not necessarily the Local Sanitary Authority, to whom the medical practitioner has to report.

69. It is the duty of the Local Supervising Authority, immediately on receipt of a copy of the "medical-aid notice" to make arrangements for the Inspector of Midwives to visit the midwife in charge of the case. The Inspector of Midwives can then, in co-operation with the doctor, at once arrange, through the Medical Officer of Health, for the carrying out of the appropriate treatment. In districts where the same Council is the Local Supervising Authority and the Maternity and Child Welfare Authority, facilities for treatment can readily be offered should the doctor require them. In districts where the Local Supervising Authority is not the Maternity and Child Welfare Authority and the Local Sanitary Authority, it is clearly of importance that there should be definite arrangements between those authorities for dealing with cases of inflammation of the eyes reported by the midwife. In fact, the doctor called in by the midwife assumes full responsibility for the case; if he considers it to be a case of Ophthalmia Neonatorum, he will at once notify the Local Sanitary Authority, and thus, if the area directly administers a Maternity and Child Welfare Scheme, the authority responsible for treatment has immediate information. The Minister of Health, in his Circular 617A, states that in his opinion the appropriate authority to provide and carry out treatment, where this is necessary, is the one entrusted with the Scheme for Maternity and Child Welfare in the district. In such cases, therefore, the County, as the Local Supervising Authority, should inform the Local Sanitary Authority that a medical-aid notice has been received for a case in the area of the authority administering the Maternity and Child Welfare Scheme, the Medical Officer of Health of that authority then being made responsible for seeing that effective treatment is provided.

70. The arrangements for the notification and treatment of Ophthalmia Neonatorum as set out in detail may look cumbersome, and it might appear that precious time is lost before the Regulations can be put into effect. Their application is, however, simpler in practice than it appears in print, and we believe that the authority responsible for treatment should be aware, at a very early stage, of the existence of a case of inflammation of the eyes which may finally be notified as Ophthalmia Neonatorum, and that, generally speaking, the machinery for dealing promptly and adequately with such cases is very fully developed.

71. The aim of the prevailing practice is to ensure that every case in which a midwife summons medical aid is visited by an Inspector of Midwives or a Health Visitor immediately on receipt by the authority of a copy of the " medical-aid notice " from the midwife, and to arrange for the Health Visitor to visit every case of Ophthalmia Neonatorum notified by a medical practitioner as soon as possible after notification. In both instances it is often possible for the Medical Officer of Health of the Maternity and Child Welfare Authority to offer to the doctor in charge of the case the co-operation of his department in whatever treatment is required, especially by arrangements made by the Local Authority for Home Nursing or Hospital treatment. In some areas there does not seem to be sufficient liaison between the Medical Officer of Health and the general practitioner in this matter, and we are strongly of opinion that every effort should be made to strengthen or to create such liaison.

In well-organised towns it is usually possible for the visit of the Health Visitor to be paid within two or three hours of the receipt of the notification; in country areas also, if the information comes by way of a medical-aid notice, a visit can usually be paid within a few hours; if, on the other hand, the notification is made by a doctor to the Local Sanitary Authority and if the latter is not a Maternity and Child Welfare Authority (*i.e.*, does not employ its own Health Visitors) there may be delay because the notification has to be forwarded to the County Health Department. Even when the notification is reported by telephone, there may be delay in getting into touch with the Health Visitor, if she is any distance from her centre; in the meantime the midwife is carrying out such treatment as she can. There are also a certain number of births, especially in remote districts, which take place without either a doctor or a midwife in attendance. It is clear that the scheme set out above necessitates the active and intelligent co-operation of several people, and serious delay may result if such co-operation is not forthcoming.

72. We cannot too strongly emphasise the fact that Ophthalmia Neonatorum is not always venereal in origin, and therefore should not be regarded as necessarily carrying with

it the stigma of venereal disease. Other infections may produce equally serious results, as was pointed out in the 1922 Report of the Departmental Committee. (*See* Chapter II., paragraph 33.)

73. We turn now from the ascertainment of cases to their treatment.

In 1922 the Departmental Committee made the following recommendations with regard to Ophthalmia Neonatorum:—

"We recommend—

(i.) that the Ministry of Health should take steps to ensure that adequate nursing provision is always available for cases of Ophthalmia Neonatorum which are not admitted to Hospital ;

(ii.) that in every area, whether urban or rural, the Ministry of Health should take measures to secure the provision of suitable hospital accommodation for babies suffering from Ophthalmia Neonatorum and for their mothers ;

(iii.) that arrangements should be made for pupil midwives to visit Ophthalmic Hospitals or the Ophthalmic Departments of General Hospitals for the purpose of gaining direct experience of Ophthalmia Neonatorum ;

(iv.) that in cases of suspected Ophthalmia Neonatorum facilities for consultation with an ophthalmic surgeon and for bacteriological investigation should be provided wherever practicable."

74. In many places arrangements for home nursing have been made, and facilities for hospital treatment are available. A few authorities employ specially trained ophthalmic nurses or contract for their services. Among these are Manchester, Liverpool, and Birmingham. In Manchester there are four specially trained ophthalmic nurses in the service of the authority, and in Liverpool two. The Birmingham Authority pay a grant to the Birmingham and Midland Eye Hospital for the services of two specially trained external nurses on the staff of the eye hospital who visit and supervise all cases of Ophthalmia Neonatorum within the city area. Some authorities arrange for nurses, chiefly district nurses (in these cases by an arrangement with the District Nursing Association) to undertake home nursing in certain cases of infectious illness, including Ophthalmia Neonatorum. In others the Health Visitor supervises and assists the mother in carrying out the doctor's instructions. One large authority arranges that all their Health Visitors shall receive instruction in the treatment of Ophthalmia Neonatorum at a special hospital.

75. In County Boroughs and big towns arrangements for home nursing of Ophthalmia Neonatorum appear to be generally satisfactory, but there are a number of County districts which are unable to provide specialist nursing of any

kind. Ophthalmia Neonatorum requires such constant attention and such skilled nursing that by far the most satisfactory way of dealing with these cases, more particularly in areas where specialist nursing is not available, is in hospital wards, where they will receive the constant attention of skilled nursing. The ideal arrangement is to admit the mother and child together; the Birmingham and Midland Eye Hospital and St. Paul's Eye Hospital, Liverpool, have special isolation wards for this purpose. St. Margaret's Hospital, Kentish Town (under the London County Council), also admits both mother and child, and provides specialist treatment for cases of Ophthalmia Neonatorum from London and the adjacent counties, and all but 6 of the 83 County Boroughs in England and Wales are able to arrange similar accommodation in hospital.

76. In all county areas some form of hospital accommodation can be obtained for cases of Ophthalmia Neonatorum, and in the majority both mother and child are accepted, but the provision of hospital accommodation fails in its purpose if it is not practicable to assign a fully qualified nurse (who has received special instructions as to treatment) to deal exclusively with the case. Many counties are fortunate in having within or near their borders Eye Hospitals or General Hospitals with Ophthalmic Departments, and in this way skilled treatment is immediately available. In some areas, where the nearest hospital is a considerable distance away, transport by ambulance is provided by the Local Authority. We find, however, that some authorities consider the provision of adequate home nursing preferable to removing the case to hospital when a long and arduous journey is involved. Such an arrangement can only be regarded as satisfactory when the home nursing provided is equal in effectiveness to the skilled nursing and constant attention already advocated for cases which are taken into hospital. The provision of home nursing for cases of Ophthalmia Neonatorum is described in paragraph 74 above. If a County Authority experiences any difficulty in arranging for the reception of a case of Ophthalmia Neonatorum at a Local Voluntary Hospital, accommodation may be provided at one of the Isolation Hospitals in the county. We emphasise the vital importance of securing that an ophthalmic surgeon be available at all hospitals admitting cases of Ophthalmia Neonatorum. Until this is done the treatment of Ophthalmia Neonatorum in hospital cannot be regarded as satisfactory.

77. In spite of the variety of ways in which provision is made for dealing with cases of Ophthalmia Neonatorum, there are still a few remote districts in which there is no nursing organisation, and in a number of areas there are no hospitals providing skilled treatment or nursing for cases of eye diseases.

**The Use of a Prophylactic as a Routine Measure.**

78. In the Departmental Committee's Report in 1922 the following observations were made on the routine use of prophylactic drugs:—

> "*Prophylactic Drugs.*—No regulations are laid down by the Central Midwives Board as to the routine use of prophylactic drugs, such as 1 per cent. or 2 per cent. silver nitrate or collosol silver, etc. The use of these drugs is not universal, but has for some years been observed in some of the best lying-in hospitals and training schools.
>
> It is well known that Credé's method—instillation of 1 per cent. or 2 per cent. silver nitrate within the eyelids immediately after birth—has proved very efficacious in preventing the onset of the disease. Nevertheless, we hesitate to recommend that prophylactic instillation of drops should be practised as a routine by midwives. Excellent results are obtained in hospital clinics where the midwives and nurses are under careful supervision ; but in the hands of the unskilled the method not only involves risks, but is apt to engender a false sense of security.
>
> (1) The midwife may be apt to think that having dropped a little solution into the eye she has done all that was necessary and to neglect the scrupulous cleansing which is even more important ;
>
> (2) The use of the drugs may induce an inflammatory reaction, which, on the one hand, she may mistake for the onset of the disease and notify accordingly ; or,
>
> (3) On the other hand, she may regard as ' only a little reactionary discharge ' what is really a manifestation of the disease itself.
>
> While, therefore, we are fully satisfied as to the efficacy of Credé's method in skilled hands, we cannot recommend it for routine adoption by midwives.
>
> We consider, however, that it should be used under medical supervision in all cases where vaginal discharge is known to exist. Where such prophylactic method is adopted, we consider nitrate of silver to be the most effective agent, but that it should not be used in stronger solution than 1 per cent."

79. An endeavour has been made to discover to what extent Medical Officers of Health favour or discourage the routine use by midwives of the instillation of drops, such as a solution of silver nitrate. Generally speaking, an analysis of the general practice advocated in 83 County Boroughs shows that in 50 per cent. some form of prophylaxis is used by midwives as a routine measure, varying from 1 per cent. silver nitrate to such silver preparations as collosol argentum, protargol, argyrol, etc., whereas in the remaining 50 per cent. definite objection is raised to the use by midwives of drops as a routine measure, the reasons given approximating closely to those set out in the paragraph from the 1922 Report quoted above. It

is not possible to give an accurate account of the practice in the county areas, as the information at our disposal is incomplete.

80. While we are not prepared to insist on the need for the use of prophylactic drugs as a routine measure, we consider that the proper cleansing of a baby's eyes at birth is the first essential. This, by itself, is not an efficient prophylactic measure, unless it involves the thorough irrigation of the conjunctival sacs, which needs the co-operation of two persons. As this will often be impracticable, a method which combines cleansing of the eyes with the Credé treatment is suggested as follows:—

> When the head is delivered the outside of the lids should be wiped with a dry sterilised swab, using a separate one for each eye. When delivery is completed the baby's arms should be confined by a towel wrapped round the body to prevent infection being carried to the eyes by the baby's fingers. Before the baby is bathed the lids should again be cleansed, then gently separated, and one or two drops of the silver nitrate solution put in between the lids. It is important that the nurse's finger nails should be kept short.

This method may be regarded as a practical interpretation of Rule E. 25 of the Central Midwives Board that "as soon as the child's head is born, and, if possible, before the eyes are opened, its eyelids must be carefully cleansed" in conjunction with prophylactic treatment.

81. The criticism in the 1922 Report of the possible effect of the routine application of the Credé treatment is an argument for the better training of midwives rather than for the giving up of the method. The improved training of midwives and the recognition of the importance of their services under the Maternity and Child Welfare Schemes of Local Authorities are facts which have led us to examine the recommendations of the Departmental Committee in the light of modern conditions. We are informed that the number of untrained midwives has greatly decreased in recent years, and that comparatively few will be found practising to-day.

Under the revised Rules of the Central Midwives Board "a midwife must not on her own responsibility use any drug unless, in the course of her obstetric training, whether before or after enrolment, she has been thoroughly instructed in its use and is familiar with its dosage and methods of administration." Disregard of this rule involves grave penalties. The Central Midwives Board make no recommendation as to the use of prophylactic drugs which they assume to be the concern of the Local Supervising Authority.

82. The further criticism in the 1922 Report that the use of silver nitrate may induce an inflammatory reaction which the midwife might notify as the onset of the disease is met by the

revised Public Health (Ophthalmia Neonatorum) Regulations (fully described in paragraphs 67-70) which place the duty of notifying a case of Ophthalmia Neonatorum solely upon the doctor. The risk that the midwife may regard as "only a little reactionary discharge," what is really a manifestation of the disease itself is covered if the midwife does her duty in summoning medical aid for "any inflammation of the eyes, however slight."

83. We are therefore of opinion that at the present time the most efficient prophylactic treatment, over and above the proper cleansing of the eyes, is 1 per cent. silver nitrate, the proper use of which should be included in the training of every midwife. A stronger solution than 1 per cent. is not necessary, and is more likely to cause a reactionary discharge and so lead the midwife to summon medical aid unnecessarily. The solution of nitrate of silver should be carried in a small drop bottle of such a shape as to be recognisable by touch as well as by sight, and renewed at least once a month, as it is liable to decomposition and to become stronger, owing to evaporation, if kept for a longer period.

**Other Causes of Blindness in Infancy.**

84. Although Ophthalmia Neonatorum is one of the most serious causes of blindness in infancy, we must make a reference to other forms of injury or disease which may lead to blindness. The eyes may be injured during birth, with resulting blindness, but this damage is usually limited to one eye.

There is a risk of injury to the eyes of a baby under one year of age from objects which it is allowed to handle, and cases have been known where a needle carried in the dress of someone nursing the baby has perforated the baby's cornea and damaged the lens. Care and common-sense alone can prevent such accidents, but, since they have been known to happen, the possibility of their occurrence should not be overlooked.

## Pre-School.

85. This section deals with the provision for the ascertainment and treatment of eye conditions in children between one and five years of age which may lead to blindness. We have become accustomed to the idea that in the first year of life a child should receive constant medical supervision, exercised, in the case of the majority, through the Health Visitors and Clinics of the Maternity and Child Welfare Authority, but as infancy is left behind systematic supervision often ceases. In homes where the parents are educated to

notice any signs of ill health or abnormality in their children, conditions injurious to sight may be detected early and medical advice obtained, but many conditions require trained observation for their detection, and delay in obtaining early treatment is undoubtedly dangerous.

86. Some authorities have instituted a system of medical examination of children at three or four years of age. For example, in Smethwick an invitation is sent to every mother to bring her child on or near its fourth birthday for a complete medical examination, when any defects which may be present are noted. These cases are then followed up and any necessary treatment arranged for. Similarly, in Huddersfield an endeavour is made to get every child examined on its third birthday. The Health Visitor or Infant Welfare Doctor either delivers or follows up the invitation, and every effort is made to popularise the arrangement and to encourage mothers to take a pride in having a sound and healthy child to bring for examination, as well as to realise that if there should be anything wrong the sooner it is dealt with the better. This system appears to have met with sufficient success to justify its continuance as a recognised procedure.

87. The majority of children attending Nursery Schools and Nursery Classes come under the supervision of the School Medical Officer, and their medical examination and treatment is therefore provided for. The arrangement whereby some authorities utilise (by agreement between the Maternity and Child Welfare and the Education Departments) the services of the school clinic and of the ophthalmic surgeon attending there for the examination of children under school age commends itself to us as an economical and desirable arrangement, and one which is capable of further expansion. Such an arrangement should, for instance, have a definite effect on the early observation and treatment of squint.

88. The treatment of external eye conditions at the Minor Ailments Clinics designed for children of school age should be made available to pre-school children.

89. We have seen that, in the majority of cases, the ascertainment of children between one and five years of age with eye conditions which may lead to loss of sight depends to a large extent upon the observation of the Health Visitor or District Nurse, and upon the initiative and co-operation of the parents. We have not sufficient evidence to say whether many serious defects of vision do, in fact, remain undetected until the child reaches school age, but in too many cases squints are first seen by an ophthalmic surgeon at too late a stage for successful treatment. It is not generally known that a squinting eye is usually partially blind (amblyopic). (*See* Chapter II., para-

graph 30.) In certain of such cases vision may be materially improved by suitable treatment. It is the general opinion that such treatment is useless unless begun at an early age, and in any case not later than at seven or eight years. A squinting eye may be put straight by operation at a later age, but this does not restore vision.

90. Since an amblyopic eye increases the danger of blindness should the remaining eye sustain an injury or become affected by disease, there is strong argument for making every effort to preserve or to encourage the capacity of vision in the squinting eye. The establishment of a number of Orthoptic Clinics by hospitals or by Health or Education Authorities is evidence of the greater attention that is being paid to squint, and much interesting experimental work is being done in the training of squinting children by orthoptic exercises.

91. Our review of such preventive measures as exist to safeguard the eyes of children between one and five suggests that a critical survey by the responsible Medical Officer of Health of his scheme for the pre-school child, especially with regard to the early diagnosis and treatment of serious eye defects, might be fruitful in results.

92. We have already recommended that the service of an eye specialist should be available for Isolation Hospitals, but we repeat it here in relation to cases of measles, where, owing to the possibility of serious eye trouble accompanying or resulting from that disease, the provision of expert ophthalmic supervision must be strongly advocated ; this principle naturally applies to the treatment of children of all ages.

## School Age.

93. The services made available by Local Education Authorities which influence the prevention of blindness in children of school age are the ascertainment and treatment of children with visual defects and eye disease.

### Ascertainment of Children with Visual Defects and Eye Disease.

94. The Report of the Committee on Partially-Sighted Children, published by the Board of Education in June, 1934, gives a description of the present system of ascertainment of children with visual defects, a system which, in the words of that Report " should ensure that all cases of defective vision arising in early school life are ascertained not later than the third year after entering school."

We believe that the existing machinery for the discovery of visual defects in school children produces generally satisfactory results. There is, however, a weakness in the present scheme, which was pointed out in Chapter VI. of the Report of the Chief Medical Officer of Health to the Board of Education, 1931 (on the Health of the School Child), in that the majority of children are not submitted to an examination of visual acuity as a routine measure until they reach the age of eight. This weakness may to some extent be overcome if teachers and School Medical Officers are on the watch for signs of visual defects in children between the ages of five and eight, but, even so, some cases will escape detection. We are therefore of opinion that the Board of Education should encourage School Medical Officers to investigate the practicability of making an examination of the visual conditions of children as soon as possible after their entry into school. In making this recommendation we find ourselves in agreement with the Report on Problems relating to Partially-Sighted Children and the Report on the Health of the School Child (1931) referred to above.

**Treatment of Children with Visual Defects.**

95. Three hundred and fifteen Local Education Authorities out of 316 have schemes for the treatment of visual defects. It is satisfactory to note that 193 authorities employ ophthalmic surgeons for the treatment of visual defects in children of school age. Sixty-four have the work done by School Medical Officers, with reference to ophthalmic surgeons in special cases, while in 58 all cases are dealt with by the School Medical Officers.

We consider that the *minimum* requirement for a satisfactory scheme should be an arrangement by which the Local Education Authority can refer to an ophthalmic surgeon all children whose cases present difficulty to the examining Medical Officer.

96. The treatment of visual defects of children attending a special school is dealt with exhaustively in the Report of the Committee on Partially-Sighted Children, and an attempt to gauge the influence of the special school *régime* on the prevention of the increase of myopia and sequelæ of myopia is made in Appendix C to that Committee's Report. That Committee could come to no definite conclusion as to the influence of the special school on myopia apart from the fact that their investigation emphasised the need for further research, the lines of which were indicated in Appendix C. We are in agreement with the conclusion stated on page 156 of their Report: " the influence of myopia in causing blindness and the part played by the special school in preventing such blindness is the most important of all problems with regard to myopia which needs further consideration."

**Treatment of Children with Eye Disease.**

97. Arrangements for the treatment of "minor ailments," including external diseases of the eye, are made by Local Education Authorities. In the majority of areas where the services of an ophthalmic surgeon are available such cases would be referred to him. We believe that in order to get the best results the treatment of eye disease at clinics should be carried out under the supervision of an ophthalmic surgeon.

98. Certain diseases of the cornea, such as some types of corneal ulceration, which, by recurrence of the attacks, may lead to much scarring of the cornea with consequent severe diminution of sight, are frequently associated with conditions of impaired health. The Open-Air School, in treating the underlying cause, may therefore be an agent in the prevention of the complications which may lead to blindness.

99. Arrangements for the treatment of the more severe diseases of the eye, such as trachoma, intractable blepharitis, and conjunctivitis, and keratitis in all its forms, should be made in hospital or in a special hospital school. An example of the latter is the White Oak Hospital, Swanley, Kent, maintained by the London County Council, of which an account is given in Chapter IV. F. (iv.) of the Report on Partially-Sighted Children. A Special School for 99 girls which formerly admitted cases of trachoma and other types of ophthalmia was closed in 1928, and a similar school for 250 boys has since been converted into an Open-Air School; in both cases the change was due to the great reduction in the number of trachoma cases seeking admission.

We have been unable to gather conclusive evidence of a demand for another special hospital school in a different part of England, but an ophthalmic surgeon in a midland county expressed the opinion that cases which had to be treated at a large Eye Hospital in a very crowded area would benefit immeasurably from such treatment and environment as is at present only provided by White Oak Hospital, Swanley.

100. Arrangements for the treatment of children suffering from venereal diseases are referred to in paragraph 63, and we suggest that the recommendation made therein should apply not only to women and young children but to children of all ages.

Arrangements for the treatment of syphilis have been made by the Councils of all Counties and County Boroughs under the powers of the Public Health (Venereal Diseases) Regulations, 1916, and we would emphasise the importance in the case of eye diseases of syphilitic origin, such as interstitial keratitis, of the fullest advantage being taken of the facilities so afforded for the treatment of the syphilitic conditions, in addition to the expert ophthalmic attention which is essential.

## Adolescence and Adult Life.

101. The School Medical Service, systematic and comprehensive within its agreed limits, ceases perforce to concern itself with the majority of young persons when they leave school shortly after their fourteenth birthday. At the age of 16, however, they come as insured workers within the scope of National Health Insurance. The interval between school-leaving age and the age of 16 constitutes the notorious " gap " in the social services to which attention has repeatedly been called by those concerned with the welfare of adolescents, who have pointed out that, generally speaking, working boys and girls are under no medical supervision during the first years of their working life and are offered no medical advice or treatment. For the majority of children whose eyesight has given no trouble at school, the " gap " is not of serious importance in relation to prevention of blindness. Preventable causes of blindness which may occur during this age period are injuries and inflammatory conditions. Anyone with an injured eye is likely, of his own account, to seek medical advice, and the same applies in cases of inflammation liable to cause blindness, because their onset is associated with either pain or irritation of the eye.

102. The " gap " is of real importance, however, in cases of progressive myopia. The Committee on Partially-Sighted Children have pointed out in their Report that blindness from myopia does not usually occur until the age of 45 or later. Nevertheless, there may be serious progression in the degree of myopia during adolescence, and supervision by an ophthalmic surgeon after the child leaves school may be an important factor in diminishing the risk of subsequent blindness.

103. The Report of the Committee on Partially-Sighted Children (pages 42-45) gives an account of the provision made at the present time for the ophthalmic supervision of young persons leaving special schools for the partially sighted. A considerable proportion of them leave school soon after their fourteenth birthday, although the leaving age from the Special School is legally sixteen. Some Local Education Authorities maintain the ophthalmic supervision of such young persons up to the age of sixteen, in some cases withholding permission to leave at the earlier age unless the young person continues to attend the school clinic for periodical medical examination. Recommendations by the school ophthalmic officer with regard to the most suitable forms of future employment and to future ophthalmic supervision and treatment are sometimes passed on to the Juvenile Employment Bureau or Exchange. The certificates given by factory surgeons as to the fitness of young persons for employment, and the medical schemes established

by certain firms, are instanced as being to some extent helpful to partially-sighted young persons in employment. The Committee on Partially-Sighted Children go on to consider how far the various agencies at present existing can be co-ordinated in order to produce a more comprehensive system of ophthalmic supervision for the children with whom they are concerned. They point out the necessity of linking more closely the ophthalmic work of the Special School with that of the School Medical Service, and of making an effective link between the Local Education Authority's ophthalmic service and the hospitals. They conclude that " the power to establish schemes for the ophthalmic supervision of partially-sighted persons after they have left school exists, but there is definite need that those powers should be utilised more fully and that the work of the various agencies which might form component parts of such schemes should be co-ordinated." They add that " much can be done during school days by inculcating in the child a sense of responsibility for its own well-being."

104. Briefly, then, the position is that there is no ophthalmic supervision for the majority of young persons in early adolescence, and very little available even for those adolescents whose known eye conditions make them evident subjects for ophthalmic care. The services provided by the eye hospitals and the ophthalmic departments of the general hospitals make no distinction of age and are available for young and old alike. But the eyesight of the nation can only be adequately safeguarded if there is periodical examination of the young as well as suitable treatment available. For young workers in early adolescence neither examination nor treatment is provided as a State service. The initial medical examination of young persons under the Factory Act provides some safeguard for them, but it may be as well to point out here that these examinations are limited to certifying young persons (who constitute not more than half the total juvenile labour force) as suitable for employment in factories and certain workshops, which the Certifying Factory Surgeon may limit by conditions. These examinations safeguard the employer against employing unsuitable young people; they protect the young person in so far as they may prevent his employment in an unsuitable occupation.

105. We wish, therefore, to endorse the recommendation made by the Committee on Partially-Sighted Children,* and referred to in paragraph 103 above, with the rider that the arrangements which they suggest for the continuance of

* " The power to establish schemes for the ophthalmic supervision of partially sighted persons after they have left school exists, but there is definite need that those powers should be utilised more fully and that the work of the various agencies which might form component parts of such schemes should be co-ordinated."

ophthalmic supervision of partially-sighted children on leaving the Special School should also apply to all children with serious eye defects on leaving the ordinary Elementary School. Such provision evidently cannot be made without some effective linking up of the School Medical Services with the juvenile employment services and without an extension of the National Health Insurance Acts so as to bring all young persons under them on leaving school.

106. It is a question of considerable interest and importance whether any arrangements which are made or are in contemplation for the medical examination and treatment of young persons under the age of sixteen should be extended for at least two more years, that is, up to the age of eighteen. The period of adolescence does not end at sixteen, and most of the arguments which enforce the need for special care between the ages of fourteen and sixteen apply with equal force to the ages of sixteen to eighteen. When with growing years the maintenance of health becomes increasingly a personal responsibility, prevention of blindness depends largely on ensuring that every person in need of advice about his eyes is aware of the facilities which exist for obtaining it, and also realises the importance of seeking it as promptly as possible. After the early years blindness, apart from accidents, is often due to general disease, and the prevention of blindness to this extent becomes part of preventive medicine. For this reason alone it is highly desirable that persons with defects of sight should seek expert medical advice with a view to finding out whether the cause of such defects is some disorder of general health. The need for medical supervision of childhood, with periodical medical examination, is universally recognised. Periodical medical overhaul throughout adult life is wisely advocated in a number of quarters, and we hope that willingness to undergo such overhaul may become more general. Some insurance companies provide for free medical examination of holders of life insurance policies, and offer this service at yearly or two-yearly intervals, though it may be noted that the companies concerned do not take any special action on the findings of the medical examination. In the United States of America a number of insurance companies offer free medical examination to all their policy holders. In England there is a movement, still in its infancy, for the formation of health societies, the members of which arrange for periodical medical examination and treatment. Some large firms have established medical departments, and organise medical examinations of all young persons entering their factories. In connection with all such arrangements, we suggest that the eyes should be examined by ophthalmic surgeons.

107. We are informed that one County Council have incorporated in their scheme for prevention of blindness, made

under Section 66 of the Public Health Act, 1925, a clause providing for the voluntary notification by medical practitioners, or otherwise, of persons threatened with blindness. Although it is too soon to assess the value of this experiment, we have included this clause in the draft model scheme at the end of this chapter, and commend it to the consideration of Local Authorities.

## General Facilities for Advice and Treatment.

108. For those who cannot afford to consult a specialist privately many facilities exist for obtaining expert advice.

We propose to make a brief survey of the facilities which exist for ophthalmic examination and treatment of persons in adult life, and to consider this part of our subject under the following heads:—

Eye Hospital and Ophthalmic Department of a General Hospital either voluntary or provided by a Public Authority.

Follow-up service for Hospital cases.

Provision of ophthalmic benefit by Approved Societies under National Health Insurance Schemes.

National Ophthalmic Treatment Board.

Outdoor District Medical Service provided by the Public Assistance Authority.

Arrangements of Local Authorities under Section 66 of the Public Health Act, 1925.

### The Eye Hospital and Ophthalmic Department of a General Hospital either voluntary or provided by a Public Authority.

109. We give a list of Eye Hospitals and Hospitals with facilities for ophthalmic treatment in Appendix VII., arranged in the following categories:—

A.—Hospitals with In- and Out-Patient Ophthalmic Departments, having a certain number of beds reserved for eye cases and a resident house surgeon.

B.—Hospitals with In- and Out-Patient Ophthalmic Departments, having a certain number of beds reserved for eye cases but no resident house surgeon.

C.—Hospitals with an Ophthalmic Department with consulting hours on certain days of the week.

D.—Hospitals which can call upon the services of an ophthalmic surgeon when required.

110. Fifty years ago, or even less, it would have been true to say that many people were unable to make use of either

ophthalmic or general hospitals because of the difficulties of travel, but to-day, with ever-increasing means of transport, villages hitherto isolated have been linked up with the towns, one result of which has been a decided increase in hospital attendances from rural areas.

Not only are hospitals easier of access than they were fifty years ago, but the advantages due to the enormous advance in medical science during this period are available to the patients attending them.

As blindness may be due to some disorder of general health, it follows that facilities should exist whereby a patient attending hospital for an eye complaint found on investigation to be due to such a cause may be referred elsewhere for appropriate treatment. Such facilities exist if the patient attends the Eye Department of a General Hospital, and most Eye Hospitals have a similar connection with some neighbouring General Hospital. If there is no such connection, we think that the Eye Hospital should have a general physician on its staff.

111. There is, however, a definite drawback to hospital attendance which is not connected with the means of getting there. The time which has to be given up, often resulting in the loss of a day's work, is a serious consideration in many cases, and may lead to delay in seeking the help the hospital can give, unless the eye condition is so painful as to drive the patient to seek immediate help. A few hospitals have evening sessions for the benefit of those who, by reason of their work, cannot afford to attend a hospital at other hours.

**Follow-up Service for Hospital Cases.**

112. An experiment on a small scale was made in this country in order to discover how far assistance in prevention of blindness could be given, or how hospital treatment could be rendered more effective, through a system of " following-up " persons already in attendance at an Ophthalmic Hospital. This experiment was undertaken on behalf of the Committee by one of our members, Mr. J. D. Magor Cardell, in connection with his work at the Central London Ophthalmic Hospital. The voluntary social worker selected for the experiment, who had had no previous knowledge of ophthalmology nor of an almoner's work, was instructed by him in the administration of the Out and In-patient Departments and in the simplest rudiments of eye diseases and their local treatment.

The value of such work consists in securing the regular attendance at hospital of patients who otherwise would not receive the necessary treatment. Many patients, for various reasons, neglect attendance at hospital, and the social worker

visiting them should be able to learn the reason in each case and to find means of overcoming the patient's difficulty. This may be a financial one, or, in the case of chronic glaucoma, for example, patients may be unaware of the importance of regular attendance, and the worker can persuade them how essential this is.

113. Service such as that carried out for the purpose of our experiment need not be limited to the voluntary worker, and the appointment of two full-time ophthalmic nurses by the Birmingham and Midland Eye Hospital to "follow-up" eye patients in their homes is a satisfactory development of the principle of external supervision in eye cases.

114. The Lady Almoner movement was initiated at the Royal Free Hospital in London in 1895, and aims, among other things, at making treatment of disease in needy patients more effective by co-operating on their behalf with social agencies outside the hospital. This service has been rendered wherever possible, but we are of opinion that there are strong arguments for a special development of their Almoners' Service by Eye Hospitals and Hospitals with Ophthalmic Departments. While we do not consider that any specialised eye training is needed, it is essential that the almoner who undertakes to follow up ophthalmic cases shall work in close touch with the ophthalmic surgeon as well as with the patient. We understand that, until recently, the supply of trained almoners has exceeded the demand, and the pressing need for economy may sometimes have led to a reduction of this specialised service and the employment of less highly trained workers, or to no such service being provided. A system of "follow-up" work for ophthalmic cases, which includes outdoor visiting where necessary, could readily be organised through the existing Social Service Department of a Voluntary Hospital. The work should be part of the Almoners' Department, and should be undertaken either by the Lady Almoner herself or by workers under her supervision.

The varied nature of the problems which are likely to confront such workers will call for wide experience in social service, and for this reason the appointment of trained workers is to be preferred. The appointment of Lady Almoners to a number of Municipal Hospitals is a practical expression of the importance that Local Authorities attach to such a service. Wherever a "follow-up" department is attached to a Voluntary Hospital its opportunities of usefulness will be increased through close co-operation with the Local Public Health Authority, which has at its disposal such resources as Health Visitors and an ambulance service as well as the power to make arrangements for the assistance of needy cases, either financially or in other ways.

**Provision of Ophthalmic Benefit by Approved Societies under National Health Insurance Schemes.**

115. Ophthalmic benefit under the National Health Insurance Acts is an "additional benefit," that is to say, it is a benefit which may be adopted by an Approved Society if at the periodical valuation they are shown to have a surplus; ophthalmic benefit, when adopted by an Approved Society, must be administered in accordance with the Additional Benefits Regulations, 1930, and in 1933 expenditure on this benefit, in England, amounted to over £384,000. If the Society's general arrangements include ophthalmic benefit, they must pay for it, provided the member asks for it by some "approved" method and the Society are satisfied as to the need for it.

116. It will be seen that ophthalmic benefit is an additional, not a universal benefit given by all Approved Societies, and that if neither the Society nor the member press for an examination by an ophthalmic surgeon, such examination may not take place. In cases in which the eyes are healthy and all that is needed is the correction of refractive errors by glasses no harm may be done. But the Departmental Committee on the Optical Practitioners (Registration) Bill, 1927, stated in paragraph 32 of their Report that "we are satisfied that the number of cases in which the patient may miss the opportunity of remedial treatment if the case is not handled by an oculist is by no means negligible." They quoted certain statistics submitted to them which showed that of 2,000 cases received in an ophthalmic hospital, after eliminating some 66 per cent. which were clearly cases requiring treatment for some condition other than an error of refraction, no less than 63 per cent. of the remaining 664 which appeared in the first instance to be simple refraction cases were discovered to have complications which, in the interest of the patients, required treatment by an oculist. While the Committee said that it would not be fair to draw any general deduction from these figures, they, nevertheless, thought it right to place on record the opinion quoted above. This opinion is confirmed by certain statistics published by one of our members, Mr. N. Bishop Harman, in the *British Medical Journal* on October 6th, 1934. The records of 10,085 patients examined by 47 doctors under the Scheme of the National Ophthalmic Treatment Board (described below, paragraph 118) were classified with the following results:—

| | |
|---|---|
| Number of cases of error of refraction only ... ... | 6,464 or 64·09 per cent. |
| Number of cases of error of refraction *plus* one or more "other eye conditions" ... | 2,940 or 29·15 per cent. |

| | | |
|---|---|---|
| Number of cases without an error of refraction but with one or more " other eye conditions " | 580 or | 5·75 per cent. |
| Number of cases with no appreciable eye defect ... ... | 101 or | 1·00 per cent. |

These figures show roughly that two in every three persons examined had refractive errors only, and one in every three had " other eye conditions." Mr. Harman quotes from the records of certain Approved Societies which represent several millions of persons and provide ophthalmic benefit to several thousands of their members. In these returns the percentage of cases referred by the sight-testing opticians to ophthalmic surgeons ranges from 1 per cent. to 4·6 per cent., an average of 3 per cent., in striking contrast to the 29·15 per cent. found by ophthalmic surgeons to be suffering from other eye conditions.*

The rules of the National Ophthalmic Treatment Board provide only for the admission of primary or unselected cases ; nevertheless it is possible that some few of the cases referred to the ophthalmic surgeons for examination under the National Ophthalmic Treatment Board may have been selected cases. After making full allowance for this factor, the discrepancy is great and the figures strongly support the view expressed by the Departmental Committee in 1927.

117. From the point of view of the prevention of blindness it is of the first importance that everyone suffering from disease of the eye should be examined by an ophthalmic surgeon. But there is a factor militating against this in the National Health Insurance Scheme, which is described in paragraph 25 of the Report of the Departmental Committee of 1927 as follows: " It appears, however, that in a very considerable number of cases, insurance doctors, recognising their own limitations in diagnosing accurately refractive errors and diseases of the interior of the eye, make a habit of recommending all cases involving such errors or diseases for reference to an oculist. Thus, Approved Societies have incurred a fee of £1 1*s*. in cases where, in fact, nothing but simple refractive treatment is required, and it has been found that this entails too severe a strain upon their funds. As a result, the group of Approved Societies referred to in paragraph 11 " (with about 6,000,000 insured persons) " have adopted the practice of sending all cases recommended for ophthalmic benefit direct to an optician, except where they are satisfied by some evidence other than a bare recommenda-

* Similar results have been obtained by a recent survey of a further 10,000 cases, and the percentages comparable with those quoted above are 64·22 per cent., 27·88 per cent., 7·36 per cent. and 0·54 per cent. (*see* Supplement to the *British Medical Journal*, 15th February, 1936).

tion that reference to an oculist is necessary, while the optician recommends such a reference in those cases in which it appears to him that something more than the provision of glasses is required." If opticians were qualified to recognise the presence of disease this procedure might be less open to objection. The Departmental Committee of 1927 state in paragraph 33 that "a great deal of the evidence on the part of the opticians was directed to showing that the more highly qualified modern optician is given such a training as will enable him to recognise the presence of such disease," and the Committee added that it seemed to them impossible to escape from the conclusion that State recognition of sight-testing or optometry must carry with it the implication of ability to exclude the possibility of the existence of disease before prescribing glasses. In summing up the Committee stated (paragraph 34 of their Report): "In so far as the ability to detect disease would be implied by admission to the register, we feel obliged to say that we are not satisfied that there is any training for opticians sufficiently thorough to avoid the danger which is involved in the possession of a little medical knowledge . . . . We are satisfied . . . . that none of the teaching provides anything in the way not merely of general medical training, but of specialised medical training pertaining to the eye which is comparable to the training required of a medical practitioner."

The views of the Departmental Committee of 1927 reinforced those of the Departmental Committee on the Prevention of Blindness, 1922, expressed in Chapter XVI. of their Report. (*Treatment of Eye Diseases and Errors of Refraction by Unqualified Persons.*) Although the Departmental Committee of 1927 agreed with the Departmental Committee of 1922 in recommending, in their paragraph 44, against the formation of an official register of opticians on the ground that it was not in itself a desirable policy to set up a State register of sight-testing opticians, they added that "There remains, however, the question whether it is nevertheless necessary, having regard to existing circumstances, to adopt this expedient in the public interest." In their opinion the answer to this question depended on how far the medical profession was likely to be able to make the services of oculists available for persons in those sections of the community for whom at present they were, for economic reasons, not available. In conclusion they stated: "We are assured, for example, that so far as insured persons are concerned, negotiations are at present being conducted by the British Medical Association with a view to the establishment in all the more populous districts of clinics or other schemes by which the services of oculists would be made available at fees within the reach of approved societies, having regard to the limited funds available for ophthalmic benefit."

The negotiations referred to resulted in the establishment of the National Ophthalmic Treatment Board.

**National Ophthalmic Treatment Board.**

118. This scheme was started in 1929, and provides a combined service of ophthalmic examination, prescription of glasses, if required, such simple operative treatment as can be given on a single visit, and a report, when necessary, for the guidance of the private practitioner. The ophthalmic examination is carried out by a medical practitioner whose qualifications and experience in eye work have been approved by the Ophthalmic Committee of the British Medical Association. Glasses are dispensed in accordance with the ophthalmic medical practitioner's prescription by opticians who undertake dispensing only.

119. The scheme works in the following way: the insurance doctor, if he considers the patient's eye condition to be outside his scope and to require examination by an ophthalmologist, can, if the patient so desires, give him a recommendation in writing to the effect that his eyes should be examined by a specialist. The doctor can explain to the patient that such an examination is to be obtained through the National Ophthalmic Treatment Board. If the patient is entitled to ophthalmic benefit through his Approved Society, he may ask to receive such benefit through the National Ophthalmic Treatment Board, and can obtain it under this scheme even if his Society make alternative arrangements for applying ophthalmic benefit to their members. Unless, however, the insured patient is advised by the insurance doctor to apply for ophthalmic benefit under the National Ophthalmic Treatment Board, the patient may not himself appreciate the difference between examination by an ophthalmic medical practitioner and a sight-testing optician. In cases where the patient applies to his Society for ophthalmic benefit through the National Ophthalmic Treatment Board, he obtains an authorisation from his Society which he takes to the local *dispensing* optician who represents the Board in his district. This representative arranges an appointment for the patient with an ophthalmic medical practitioner on the list approved by the Ophthalmic Committee of the British Medical Association, and the patient can make his own choice from among the doctors whose names are on this list. If, when the patient has been examined, glasses are prescribed, the prescription is made up by the dispensing optician who has arranged the appointment. Fixed charges are made, and the dispensing optician, on behalf of the Board, carries out the financial transaction between the Approved Society and the Board. One advantage over the hospital which this scheme possesses is the fact that the patient can be seen by appointment, and in the case of an insured person entitled to ophthalmic benefit his financial obligation is very small.

This scheme is also available to persons who are not insured under the National Health Insurance Acts and whose family

income does not exceed £250. Such persons are required to sign a declaration with regard to their family income, and the dispensing optician then makes an appointment with the ophthalmic medical practitioner in the same way as for the insured person, but in these cases the cost of the consultation under the scheme and of glasses, if these are prescribed, is borne by the patient himself.

**Outdoor District Medical Service provided by the Public Assistance Authority.**

120. Under the Poor Law it is the duty of every Public Assistance Authority to make arrangements for the treatment of the destitute sick. By far the commonest arrangement is for the area of every Public Assistance Authority to be subdivided into districts, each district being in charge of a general medical practitioner who is resident in the district. Normally all the home treatment which is required by a patient is given by this District Medical Officer; if hospital treatment is required, the District Medical Officer can send the patient into the Public Assistance Hospital in his district. A large number of authorities would be willing to send patients requiring treatment of a special kind to an appropriate hospital at public expense. It is possible for a Public Assistance Authority to provide consultations with a specialist on the request of a district medical officer, but this power is not extensively used, as the patient is more commonly sent into the appropriate hospital.

**Arrangements of Local Authorities under Section 66 of the Public Health Act, 1925.**

121. Powers are given to County Councils and Local Authorities (other than the London County Council) under Section 66 of the Public Health Act, 1925, with the consent of the Minister of Health, " to make such arrangements as they may think desirable for assisting in the prevention of blindness, and in particular for the treatment of persons ordinarily resident within their area suffering from any disease of or injury to the eyes."

Up to the present arrangements under this section, including such measures as the provision of spectacles and hospital treatment and the payment of travelling expenses in necessitous cases, have now been made by twenty-one Local Authorities in England and Wales.

The fact that the powers given are permissive and that the section is open to the most varying interpretations may partly account for the small amount of notice that it appears to have received. We have reason to hope that the preparation of a Model Scheme under this section will materially assist those

Authorities whose interest is aroused and to whom some form of guidance may be acceptable to devise a working arrangement whereby the powers they possess can be utilised with the best and most economical effect. Preventive medicine is essentially a concern of Public Health Departments, and the inclusion of prevention of blindness among their activities should be a natural and inevitable development of our Public Health Services.

The need for a comprehensive scheme of assistance for cases of suspected eye disease is undoubtedly greater in rural than in urban areas.

While we have attempted to make the Model Scheme which follows as comprehensive as possible, it will be appreciated that it is largely experimental and, as a result of experience, it may be found desirable to modify or extend the arrangements for the provisions made in it.

## MODEL SCHEME.

THE ..... COUNCIL (hereinafter called " the Council "), in the exercise of their powers under and by virtue of Section 66 of the Public Health Act, 1925, may make all or any of the following arrangements for assisting in the prevention of blindness, and in particular for the treatment of persons ordinarily resident within their area suffering from any disease of or injury to the eyes.

The Council may—

(1) Arrange for the ascertainment, through a system of voluntary notification to the Council by medical practitioners or otherwise, of persons threatened with blindness and in respect of each such notification may pay the sum of 2*s*. 6*d*. or such other sum as it may from time to time determine Provided that only one payment may be made in respect of any one person and provided also that no payment shall be made to any person or body who is required by any statutory enactment or regulations for the time being in force or by any terms of service or otherwise to give the notification.

(2) Arrange for the systematic visiting of persons ascertained to be threatened with blindness to secure that they avail themselves of the facilities provided for expert treatment and supervision.

(3) Provide or arrange for the provision of treatment for the prevention of blindness to persons ordinarily resident within the County (County Borough), either as in-patients or out-patients at hospitals, dispensaries, clinics or other approved places or otherwise.

(4) Provide means to enable suitable cases to take advantage of facilities for treatment, including the provision of financial assistance for that purpose.

(5) Agree with any person for him to contribute the whole or part of the cost of any treatment given under this scheme.

(6) Disseminate or arrange for the dissemination of information regarding the prevention of blindness, including the issue and distribution of literature having this object.

*Generally.*

(7) In the carrying out of this scheme and without restricting the generality of the foregoing clauses, the Council may do all such other acts and things as are incidental or conducive to the attainment of the objects of such scheme.

We offer the following suggestions for carrying out the provisions of the Model Scheme:—

(1) *See* paragraph 107 of this Report.

(3) Provision for treatment in hospital may include—

(i.) maintenance charges of in-patients ;

(ii.) fees for treatment ;

(iii.) charges to cover services to out-patients.

If the eye disease is of syphilitic origin it is essential that there should be both general treatment and expert ophthalmic treatment.

(4) This may include, in necessitous cases, the provision of free conveyance to the place of treatment.

(5) This refers to cases other than necessitous persons.

(6) *See* paragraph 143 of this Report.

## CHAPTER IV.

# OCCUPATIONAL BLINDNESS.

122. We have not taken evidence on the subject of occupational blindness, but have had the advantage of discussing occupational disease and occupational accidents with the Chief and Deputy-Chief Inspectors of Factories, with our colleague, the Senior Medical Inspector of the Home Office, and with the Medical Inspector of Mines. The Departmental Committee of 1922 heard a good deal of evidence on this subject, and we shall refer later to their recommendations and to the action which has been taken on them.

## Occupational Disease.

123. Occupational disease, which is described somewhat fully in the Report of the Departmental Committee of 1922, can be classified under results of—

Exposure to heat rays, *e.g.*, glassworkers' and ironworkers' cataract; and

The toxic effect of certain substances, *e.g.*, Lead, derivatives of Benzene, Carbon Bisulphide, and Methyl Alchohol;

Miners' Nystagmus.

### Exposure to Heat Rays.

Prolonged exposure to heat rays may produce a form of cataract known as " posterior-cortical cataract." In evidence given before the Departmental Committee of 1922 the following statement was made (paragraph 154, page 64 of the Report):—

> " ' It was surprising how almost unimpaired the sight was of several of those in whom comparatively small, but quite definite posterior-cortical cataract was present.' When mature the cataract can be extracted with a probability of success. From the point of view of permanent blindness, therefore, this disease is probably of little importance, but it is evident that a considerable loss of working capacity may be involved."

The Committee also pointed out that scientific investigation did not support the view that light, as distinct from heat, was a cause of this form of cataract.

### The Toxic Effect of Certain Substances.

The Departmental Committee were unable to obtain any exact information as to the amount of blindness attributable

to the toxic effect of the substances named, but concluded that it was very small, and we have no reason to doubt that their conclusion was correct. For example, the stringent precautions now taken to safeguard the health of workers exposed to the risk of lead poisoning have almost wholly done away with the risk of blindness resulting from this cause.

**Miners' Nystagmus.**

This disease was the subject of a special investigation by the Miners' Nystagmus Committee of the Medical Research Council in 1922, the main recommendations of which were that everything possible should be done to improve the standard of lighting in mines, since "the essential factor in the production of miners' nystagmus is deficient illumination" (paragraph 161, page 66, Departmental Committee's Report, 1922).

The Thirteenth Annual Report of the Secretary for Mines, 1933, contains the following statement under the heading of "Mine Lighting" (page 49):—

> "The end of the year 1933 saw the formal publication, under Section 86 of the Coal Mines Act, 1911, of draft general regulations designed to regulate and improve the standard of lighting in and about mines. This was the culmination of many years' work of investigation, research and negotiation, and when full effect has been given to these regulations an important step forward will have been made, not only in the direction of ameliorating nystagmus and reducing the general accident rates, but also towards greater efficiency and economy in the working of mines."

The Regulations are divided into three parts, the second of which came into operation on 1st July, 1934, and the first and third on 1st September, 1934.

Miners' nystagmus is not a cause of blindness, and, although it is a temporary handicap to work underground, it does not come within our province. We agree, however, with the view expressed by the Third Report of the Miners' Nystagmus Committee (1932), that it is highly desirable to keep men suffering from this disease employed above ground.

## Occupational Accidents.

124. Occupational accidents have been responsible for a definite amount of blindness, especially in certain industrial processes. Such accidents may be broadly classified into those occurring in—

Factories and workshops;

Mines and quarries;

Agricultural and other occupations.

**Factories and Workshops.**

The greatest risk to the eye occurs in metal working, in chemical processes through the splashing of chemicals, and in

stone dressing. The Catalogue of the Home Office Industrial Museum mentions the following metal processes as mainly responsible for eye accidents:—

(i.) grinding, glazing and polishing of metal articles;
(ii.) pouring, stirring and carrying molten metal;
(iii.) riveting, caulking, scaling and cutting out rivets;
(iv.) dressing or fettling castings;
(v.) chipping and filing metal articles (both with hand and pneumatic tools);
(vi.) smithing, including work at power hammers, drop stamps, forging machines, etc.; and
(vii.) metal working by machinery—lathes, drilling and milling machines, etc.

The eye may be damaged if it is struck by a large object, such as a rivet head, or by a minute particle of hot metal thrown off from a grinding wheel; serious damage may also result from a splash of molten metal, sulphuric acid or from lime burns (*see* Chapter II., paragraph 38).

Data do not exist for bringing up to date the Table relating to Factories and Workshops on page 69 of the Report of the Departmental Committee of 1922, but a Table has been prepared, and is incorporated in Appendix VIII. (Table A) of our Report, in which figures for accidents in factories and workshops for 1928, 1932, 1933 and 1934 are given.

It must be remembered that the figures for factories and workshops in this Table A. are totals for all industries. In his Report for 1933 (Table A, page 45), the Chief Inspector of Factories gave the incidence of eye injuries per 1,000 workers in each industry for 1928. The average incidence of eye injuries was 1·25, but in certain industries the incidence was very much higher, as shown in the Table given below:—

RATE OF EYE INJURIES PER 1,000 PERSONS EMPLOYED.

*(Based on reported accidents involving absence from work of three days and over.)*

| Industry | 1928 |
|---|---|
| Metal founding ... ... ... ... ... ... ... | 4·38 |
| Engine (not loco.) building, transmission machinery ... | 4·75 |
| Boiler-making, constructional engineering ... ... | 5·10 |
| Locomotive building ... ... ... ... ... ... | 6·90 |
| Ordnance and munitions of war ... ... ... ... | 8·55 |
| Shipbuilding ... ... ... ... ... ... ... | 5·10 |

The significant factor in the rate of eye injuries is not the industry but the process in which eye accidents occur. The relatively high rate of eye injuries in the above industries, leaving out the manufacture of Ordnance and munitions of war where the conditions are exceptional, is due to the processes involved, for example, riveting or chipping and grinding metal, or the handling of molten metal.

**Mines and Quarries.**

The risk of eye accidents is peculiarly heavy in coal mines and in quarries raising igneous rocks. The risk is greater in the latter, but in coal mines where a larger number of men are exposed to the risk, it is more serious because of the conditions in the mines and the distance which an injured man may have to travel before he can receive treatment.

Statistics relating to eye accidents in coal mines (including stratified ironstone mines), metalliferous mines (other than ironstone mines) and quarries are set out in Appendix IX. in order to make a comparison between the figures for 1919 and 1920 given in the 1922 Departmental Committee's Report (paragraphs 231, 234 and 235 of that Report) and those for 1933.

Reference to Table I. of Appendix IX. will show that between 1920 and 1933 the rate of eye accidents in coal mines involving absence from work for more than seven days rose from 3·71 to 5·73 per 1,000 persons employed. Although the total number of employed had fallen from 1,248,224 in 1920 to 797,294 in 1933, the number of eye accidents was not appreciably less. The risk of eye accidents appears therefore to have increased between 1920 and 1933, since the number of eye accidents has not fallen in proportion to the fall in the number of persons employed. Improved methods of record keeping may affect the comparative value of the figures to some extent, but it seems probable that the more general use of coal-cutting machinery in recent years is largely responsible for the rise in the accident rate.

The greatest risks in quarrying occur in quarries raising igneous rocks where the eye accident rate in 1933 was 8·9 per 1,000 persons employed. The Report of the Royal Commission on Metalliferous Mines and Quarries of 1914 (page 110) deals with the risk of eye accidents in these quarries, and concludes that eye accidents are commonest among granite workers, less frequent among limestone workers, and least common among sandstone workers. Granite cutting is a comparatively small trade, but the risk of eye injury is exceptionally high in it.

**Agricultural and Other Occupations.**

We have consulted the National Union of Agricultural Workers as to the prevalence of eye accidents in agricultural occupations, and although they have not been able to furnish

us with detailed statistics, they state that every year between 20 and 30 of their members receive injuries to the eye. Their membership, however, covers only a small number of the total agricultural workers. The majority of these eye injuries occur when men are engaged in hedge cutting and trimming, and accidents are specially liable to happen if the branches are intertwined. The cutting of one branch may release another, which may spring back and strike the man across the face, causing injuries to the eyes.

Pitching straw and threshing are also responsible for a number of accidents to the eye from protruding pieces of straw, and from foreign bodies which may be contained in the cloud of dust which usually accompanies threshing operations (*see* Chapter II, paragraph 38).

The National Union of Agricultural Workers, in discussing the subject of eye and other accidents, emphasise the fact that a doctor or a hospital is often so far distant that valuable time elapses before expert attention can be procured. Hours may be spent in a cross-country journey by 'bus or train, and there is every temptation for the man to try to deal with the trouble himself instead of seeking medical help. This lack of expert attention is particularly serious because of the special risk of infection due to the nature of such injuries. *Every effort should be made to seek medical help without loss of time*, and a considerable number of eye injuries might be avoided if employers were to provide, and the men to wear, suitable goggles. There is, of course, no legislation which covers accidents in farming, but in any case education rather than law is needed for their prevention.

Road-making and the processes it involves are also occupations in which there are no legal enactments for the prevention of accidents. Chipping stone or the glass of pavement lights, fitting paving-stones and similar jobs, are often carried on without any protection to the worker, whereas the passer-by is sometimes protected from the risk of flying chips by a screen. Roads are under the control of the Highway Authorities, and if the attention of the authorities were drawn to the risks to which these workers are exposed, they would, no doubt, be willing to make every effort to reduce such risks. Local Authorities might consider using their powers for the prevention of blindness (under Section 66 of the Public Health Act, 1925) for the protection of these workers.

## Statistics.

125. The statistics which we have quoted in Appendices VIII. and IX. do not cover even the majority of occupied persons, but they include, so far as we are aware, all the occupations in which detailed records of accidents are collected

and published. Although the largest individual occupation in this country is agriculture, there are no available statistics of accidents in this occupation.

In their Report of 1922 the Departmental Committee (paragraph 139) recommended that—

> "As soon as the proposals for pooling information in possession of the insurance companies regarding accidents have matured, the information should be made available to the Government Departments concerned."

We know that statistics as to the incidence and causation of accidents in factories and workshops and the nature of the accidents sustained are now furnished to the Home Office, and there is good reason to believe that the occupations in which the risk of eye accident is greatest are included in these returns and in those furnished to the Mines Department. Although the statistics furnished to the Home Office may not be strictly comparable with those given in the Annual Reports of the Chief Inspector of Factories, they appear to indicate that the returns published in the Annual Reports of the Chief Inspector of Factories may be taken as fairly representing the risk of accidental injury to persons employed in the different classified trades. It should be remembered, however, that in any particular industry there may be great variations in the risk of eye injuries in different processes, as indicated on page 63.

The foregoing paragraphs and Appendices VIII. and IX. deal with the number of recorded "eye accidents," but say nothing as to the amount of *blindness* caused thereby, of which no particulars are available.

The Departmental Committee of 1922 met with the same difficulty. In paragraph 165 of their Report they stated: "There is . . . . no reliable information available of the loss of vision caused by accidents in factories and workshops as a whole," but the comparative rarity of blindness caused by occupational accident was indicated in that Committee's Report (paragraph 134) by statistics furnished to them by the Commercial Union Assurance Company, and is confirmed by our own observations. The insurance figures related to 111,000 claims made on accident insurance companies, of which 2,585 (or 2·33 per cent.) were in respect of eye accidents; five of these were claims involving loss of sight of both eyes. A rough analysis of an unselected sample of 3,824 cases recorded on certificates of blindness (Forms B.D. 8) gives 80 (or 2·09 per cent.) in which the cause of blindness is assigned to occupational accident. Further, we have learnt that out of a total of more than six million insured persons the number of accidents involving loss of sight in both eyes was 11 in 1930, 8 in 1931, 5 in 1932, and 11 in 1933. The number

of accidents involving loss of sight in one eye, relating to the same totals, was 476 in 1930, 442 in 1931, 393 in 1932, and 365 in 1933.

126. The problem of eye injuries resulting from occupational accidents may be considered under two headings—

The prevention of the accident; and

Early and efficient treatment.

Recent researches in modern industrial psychology tend to show that some workers are more prone to accidents than others. If this conclusion proves to be correct with regard to eye accidents, much can, no doubt, be done in the future by eliminating accident-prone workers from dangerous processes.

## Prevention of the Accident.

The obvious way of protecting the eye is either by wearing some kind of eye protector or by the provision of a screen fixed to the machine, the work or the work-bench, to stop flying particles. Much may be done by the careful and scientific lay-out of the working positions so as to prevent danger to the eye not only from the operator's own work but also from his neighbour's, and the principles of accident prevention (commonly referred to as "Safety First") are in fact being gradually applied to the lay-out of workshops. In their 1922 Report (paragraph 184) the Departmental Committee made a number of recommendations for the prevention of eye accidents, which may be summarised and commented upon under the following headings:—

(i.) protection from flying shuttles;

(ii.) screens on lathes and abrasive wheels;

(iii.) goggles and masks—

(*a*) in factories and workshops,

(*b*) in mines and quarries;

(iv.) safety committees and propaganda.

### (i.) Protection from Flying Shuttles.

Recommendation of the Departmental Committee, 1922 (paragraph 184):—

> "The Home Office should invite the textile industries to investigate the danger of injury from flying shuttles with a view to securing improvement in the guards."

The majority of flying-shuttle accidents occur in the cotton industry, and this danger has been met by voluntary regulations in the cotton trade requiring the provision of shuttle

guards. A pamphlet on the subject of fencing machinery in the cotton industry has been issued by the Home Office, and contains a paragraph on shuttle guards. (Safety Pamphlet No. 6, Part III.)

**(ii.) Screens on Lathes and Abrasive Wheels.**

Recommendation of the Departmental Committee, 1922 (paragraph 202):—

> "The Home Office should take steps to extend the use of screens on lathes and abrasive wheels and also of side screens wherever advantageous use can be made of them in order to give protection against flying particles."

The Factory Department of the Home Office have taken steps to put this recommendation into effect so far as practicable, and the Factory Inspectors are constantly dealing with the matter. In 1933 the Home Office issued Safety Pamphlet No. 7 on "The Use of Abrasive Wheels," which contains this recommendation:—

> "*Eye Protection.*—Operatives at dry wheels should wear properly fitted goggles, or, alternatively, transparent screens should be fitted in front of the exposed upper parts of the wheels so as to intercept sparks or flying particles of dust."

The Catalogue of the Home Office Industrial Museum states that transparent screens are being used at a number of works. The London General Omnibus Company, after consultation with the Home Office in regard to eye accidents at the emery wheels at their Chiswick Works and the difficulty of enforcing the use of goggles, adopted an adjustable celluloid screen in 1926, and wrote, in 1927, that they had had no accidents when the guard had been properly used and adjusted, while in the previous year 68 eye accidents had been recorded. A recent report from the same works states that records of all eye injuries are separated weekly from other injuries, and analysed as to cause and department. This analysis is sent to the heads of the departments concerned, who take any necessary action to prevent a recurrence of the accident. Eye accidents at emery wheels are specially noted. The adjustable celluloid guards are now fitted to all emery wheels, and have been found effective so long as they are in position. Unfortunately the screens sometimes have to be removed in order to allow certain types of work to be done.

In some works this has been avoided by fitting the adjustable screen or guard onto a jointed arm long enough to bring the screen near to the operator's face instead of close to the wheel. This form of eye protection should not interfere with the work, even when large objects are being ground, and though, perhaps, a little more costly, should prove correspondingly efficient.

**(iii.) Goggles and Masks.**

*(a) In Factories and Workshops.*

Recommendation of the Departmental Committee, 1922 (paragraph 216):—

> "The Home Office should take immediate steps to issue detailed specifications of the most suitable forms of goggles and masks for the respective industrial processes."

The question of specifying particular types of goggles for the great variety of processes for which they are required presents, we are informed, considerable difficulty. The Factory Department of the Home Office have given attention to the various types which are in use with a view to recommending those most suitable for particular processes.

We find that in many cases there is great difficulty in inducing the worker to wear goggles. This may be due to the bad design of the goggles, which causes them to abrade the skin or the glass to become steamed. At other times the use of goggles may cause, rather than prevent, an accident. For example, a man carrying a ladle of molten metal may find that the goggles prevent clear vision, and therefore increase the risk of a fall. But much of the objection to goggles is based on prejudice alone, and here the education of the worker to a true appreciation of the risks involved is of great importance.

The deep-rooted prejudice against the use of goggles, referred to in paragraph 209 of the Departmental Committee's Report, appears to have its origin partly in the idea that to wear goggles indicates a lack of skill or "fussiness." If it became the fashion to use goggles or any other protective device in a workshop, many of the objections to them would disappear.

In the chemical industry, in all places where strong acids or dangerous corrosive liquids are used, sufficient and suitable goggles must be provided by the firm and worn by the men, under the Chemical Works Regulations, 1922. In a number of other processes involving risks to eyesight the provision of goggles or other protective devices is incumbent on the firm, but, even so, their use is not compulsory, and many employers experience great difficulty in overcoming the workers' objections to them.

There are, however, certain genuine reasons, quite apart from prejudice, for the widespread objection to wearing goggles when their use is not compulsory (*see* Appendix X., paragraph 4). Among these reasons are:—

(1) Bad design and fit.

This could be remedied if goggles were specially designed for special processes, and were supplied in a variety of sizes so that a selection could be made by the individual workman.

(2) Lack of ventilation, which makes the goggles hot to wear and causes them to fog, thus restricting vision and impairing efficiency.

The absence of side pieces, where these are not absolutely necessary, will solve the problem of ventilation, but there are other causes of dimmed or restricted vision which may have to be taken into account.

(3) Certain processes, such as welding, cause the special glass to become heavily pitted, and in a short time vision becomes so restricted that this glass must either be replaced or the goggles discarded.

All goggles should be so constructed that the replacing of the glass is a simple matter; and the best types of welder's goggles are now fitted with a cover-slip of ordinary glass which is cheap and can easily be replaced and which protects the special welder's glass from becoming pitted in use. The British Standards Institution has appointed a Committee, upon which the Home Office is represented, for the purpose of specifying the types of glass suitable for all classes of welding operations.

We are of opinion that investigation with regard to the best type of goggles for other processes might with advantage be undertaken by an appropriate body and specifications prepared.

(4) Some workers complain of eye strain from using goggles.

This complaint is most likely to be made by men whose vision is already poor, but may sometimes be due to the goggles being fitted with concave instead of plane glass, an error which is liable to be found in cheaply produced goggles.

A form of protection strongly advocated by our colleague, the late Mr. Bernard Cridland, especially for processes where there is the risk of foreign bodies entering the eye, is a gauze eye veil attached by an elastic round the head. This veil is made of fine, almost transparent, black silk gauze. A severe experimental test of the effectiveness of the veils in arresting fragments, chips and hot particles was made by Mr. Cridland with good results. The veils were exposed to the chippings which fly off in dressing rough iron castings and which may be projected with force sufficient to reach a distance of 10 feet. The veils were held for two or three minutes at a distance of 3 inches from the point of the chipper and at right-angles to the stream of chips. Two veils were so exposed, and neither showed penetration by the chips.

We have received a number of reports from firms where the veils are in use. These show a considerable amount of agreement as to their adequacy in processes such as grinding, polishing, fettling and cleaning castings, 16 of the 23 reports

being in their favour. One firm states that after a severe test their tool-shop foreman reported on the veils as being satisfactory in preventing sparks when grinding, small chips, hot brass chips, and splashes of suds and oil from entering the eyes.

The objections that have been raised to the veils include the complaint that they impair visibility, are too light when exposed to a draught and are therefore liable to blow upwards (a remedy for this has been found by one firm which manufactures its own supply with rexine edging), tend to become moist in use, to collect dust, and cannot easily be kept in position. There also appears to be some prejudice against wearing the veils on the ground of effeminacy, and in some workshops they are regarded as more suitable for women than for men.

In spite of these objections, we consider that there is a future for the gauze veil in all those processes where it has been found efficient.

### (*b*) *In Mines and Quarries.*

The use of goggles in coal mines is a problem of considerable difficulty owing to the conditions under which work underground is generally carried out. The risks of eye injuries from flying fragments of mineral or metal may be increased by restrictions of space, and, where protection of the eyes could only be effective if such protection were provided by a guard worn on the face, it would be unpopular, as the miner is averse from any device which might retard his quick reaction to an emergency. The Departmental Committee of 1922 were of opinion that it was not practicable to advocate the use of goggles or masks in coal mines, and our enquiries into present-day conditions have led us to much the same conclusion—at any rate with regard to the use of goggles universally. But the wearing of goggles in high-velocity dust-laden air-currents at the coal face and at the loading ends of conveyors is sometimes necessary, as also when certain other operations, such as taking down splint coal or hard band at the coal face, are being performed. At the conveyor gate, where the coal from the conveyor belt is guided into tubs, large pieces may strike the sides, and there is danger to the eyes from flying splinters of coal. In some mines where gloves are worn at the conveyor gate to prevent the men's hands from being bruised and lacerated, it has been objected that if goggles were worn they would require constant cleaning owing to the impairment of vision by coal dust and moisture, and that the gloves, which sometimes are of strong chrome leather reinforced with metal, would have to be taken off for the purpose. But such gloves are not always reinforced with metal, and it is no great hardship to take them off occasionally.

The eye accidents in coal mines are so numerous that further investigation into their causation and means of prevention is clearly desirable. The drawbacks to wearing goggles in coal mines should expedite the search for a more satisfactory form of eye protection than the types of goggles fitted with gauze wire or with unsplinterable glass. The Mines Department are continually experimenting with types of goggles but they are not ready to make any specification at present. We understand, however, that considerable investigation has already taken place to find the most suitable form of eye protection, both from flying particles and from dust, and that types of goggles fitted with non-inflammable cellular lenses are being tried and are indeed in use.

We are informed that the Mines Department are enquiring into the number of serious eye accidents occurring in the various coal mining processes, and we hope that in time a suitable form of eye protection for use in these processes may be found. The subject of protective equipment will, no doubt, be considered by the Royal Commission which has recently been appointed under the chairmanship of Lord Rockley to enquire into the provisions for the Safety of Workers in Mines.

The wearing of goggles in quarries is open to fewer objections than in coal mines, owing to the difference in the working conditions, so long as they do not restrict vision. We endorse the recommendation of the 1922 Departmental Committee "that the Mines Department should endeavour to extend the use of goggles in quarries, and for that purpose enlist the aid of the workmen's and other organisations."

**(iv.) Safety Committees and Propaganda.**

In 1922 the Departmental Committee recommended (paragraph 220) that—

> "All possible steps should be taken to encourage the development of works and safety committees with regard to the prevention of accidents, the use of safety devices and methods of propaganda, among which questions relating to the eyes would have their place."

The development of Safety Committees and other forms of accident prevention advocated by the Departmental Committee in 1922 has been constantly before the Home Office since that date. Power is given to the Secretary of State to make Orders to secure the safety of employed persons by requiring the establishment of safety organisations in individual works, and in 1927 a draft Safety in Factories Order was in fact issued. This was to be applicable to the iron and steel trade, to heavy engineering, to iron foundries employing more than 50 persons, and to shipbuilding; it required the employment of a competent safety supervisor directly responsible for and charged with certain specified duties, including constant supervision of plant,

training of new workers, investigation of accidents, co-operation with the management and operatives in the organisation of "safety first" work, and the maintenance of first-aid and ambulance arrangements. The draft Order also contained provisions relating to the detailed records to be kept of accident investigation. This draft Order has remained in abeyance, however, as assurances were received from the National Confederation of Employers Organisations, and its component associations, that they would endeavour to use their influence with their members to secure the purpose of the draft Order on a voluntary basis; these assurances have been loyally carried out, and a large number of accident prevention committees have been formed in individual factories, and district committees have been set up in many industrial areas. An example of the duties assigned to one such factory committee may serve to show the kind of work which they do. They are as follows:—

(*a*) To discuss questions pertaining to accident prevention, principles and practice throughout the works, with a view to promoting protection against accident.

(*b*) To study the reports of accidents, and to make any recommendations to the management with regard to them which they may consider desirable.

(*c*) To maintain supervision over the works, machinery and plant in regard to safety, and to report to the management any defects observed.

(*d*) To see that employees newly engaged or transferred to new work are instructed in accident-prevention practice in connection with their work.

(*e*) To see that appliances for protection against accidents, and, in particular, for stopping machinery when it should be stopped, are in proper order; and

(*f*) To see that first-aid and ambulance appliances are maintained in an efficient state, and to endeavour to secure that a sufficient number of employees in each department are trained in first-aid and ambulance work.

The following Table shows the progress which has been made in the establishment of safety organisations. Detailed figures are given for 1934, and corresponding totals, for the purpose of comparison, for 1933, 1932, 1931, 1930, and 1929, with percentages which, it will be noted, show a distinct upward trend. It should be remembered, however, that although many of the works employ a very large number of workers, these figures have only a limited application, as they are confined mainly to what are known as the "heavy industries."

| Industry | Works affected | With Safety Committees or other forms of Safety Organisation | | Without Safety Committees or other forms of Safety Organisation | |
|---|---|---|---|---|---|
| Blast furnaces ... ... | 49 | 47 | | 2 | |
| Iron and steel mills ... | 311 | 278 | | 33 | |
| Heavy engineering ... | 281 | 263 | | 18 | |
| Iron founding ... ... | 308 | 271 | | 37 | |
| Shipbuilding ... ... | 155 | 124 | | 31 | |
| Total 1934 | 1,104 | 983 | Per cent. 89·04 | 121 | Per cent. 10·96 |
| Total 1933 | 1,117 | 982 | 88· | 135 | 12· |
| Total 1932 | 1,124 | 990 | 88·08 | 134 | 11·92 |
| Total 1931 | 1,073 | 941 | 87·70 | 132 | 12·30 |
| Total 1930 | 1,040 | 817 | 78·56 | 223 | 21·44 |
| Total 1929 | 1,129 | 849 | 75·20 | 280 | 24·80 |

We learn from the Report of the Chief Inspector of Factories for 1930 that the Home Office Inspectors are agreed that marked progress has been made, not only in the establishment of Safety Committees, but in the keeping of records and calculated accident rates. One of the difficulties which had to be overcome was the reluctance of employers to allow the workers to be represented on the Committees for fear of affecting adversely the discipline of the factory; an improvement has been noted recently, and the number of Committees on which workers now serve is increasing. Where there has been an improvement in trade conditions, the Safety Committees have found that their recommendations receive more favourable consideration, and this encouragement has given a fresh impetus to their activities. The spirit of zeal and enterprise has gone beyond the Committees, and has had a beneficial result upon the workers generally.

The Chief Inspector's Report for 1933 noted the tendency to appoint Safety Officers to take the place of Safety Committees. Where the Safety Committee has been ineffective, for one reason or another, the appointment of a Safety Officer or Engineer, whose business it is to make a study of accident prevention in all its branches, to report to the managers and to initiate practical methods of accident prevention, may prove a more useful means of reducing industrial risks; on the other hand, an active and well-informed Safety Committee, on which the workers are adequately represented, may do more to ensure the co-operation of the workers, since their own safety may

seem to be more closely their own concern than if it is dealt with by an officer appointed by the management. The appointment of a Safety Officer to implement the work of the Committee provides valuable liaison between the workers and the management, but this will only be practicable in factories employing large numbers of men.

An innovation, described in the 1934 Annual Report of the Chief Inspector of Factories, seems a promising development of safety principles. In the works concerned, workmen in each department, carefully selected and with not less than two years' service, are appointed as " Safety Associates " for a period of three months with the duty of bringing to the attention of the Safety Committee any dangers or risks in connection with machinery, plant or processes which might otherwise escape notice. As fresh men are appointed quarterly, a certain amount of intensive education in safety methods is being carried out which should have a definite effect as time goes on, for each man at the end of his period of service should continue to advocate the principles which underlay his duty as a Safety Associate (*see* Appendix XI.).

Another experiment which has been started by a Safety Committee is a class of instruction for young workers in safety principles and first aid. In view of the large proportion of accidents among young persons as compared with adults (discussed at some length in the Chief Inspector's presentation of his 1934 Report) an extension of such classes appears desirable.

With regard to the new entrant into industry, the Chief Inspector suggests (page 11, 1934 Annual Report) that he might be taken round the factory before he starts work and shown the principal risks. Such demonstrations should have more effect than supplying the entrant with a copy of safety rules. Careful supervision during the first few months of employment and periodical supervision for at least a year, might reduce the risk of accidents arising out of thoughtlessness or inexperience.

The education of the worker in safety principles is always a difficult problem. General encouragement is given to the " Safety First " movement by the National Confederation of Employers Organisations, but its success in this country may be largely attributed to the efforts of the Factory Inspectors, the scope of whose work in this connection is growing rapidly. Between 1930 and 1934, 339 lectures on the subject of accident prevention have been given by the Factory Inspectors. The audiences are varied, and include representatives of firms, safety engineers, members of Safety Committees, Rotary Clubs, and working-men's organisations. Lectures on accident prevention in mines are also organised by the Mines Department and cover a wide field, the majority of the lectures being given by H.M. Inspector of Mines, the medical side being dealt with by the Medical Inspector.

A method recently adopted for keeping those interested informed of accident risks is the publication, through H.M. Stationery Office, of a pamphlet entitled "Industrial Accidents," issued quarterly and obtainable for a small annual subscription. This contains a description of accidents which have taken place and the conclusions to be drawn from them. We learn with satisfaction that this publication has secured a wide and increasing circulation.

The National Safety First Association supply information, advice and educational material for use by firms in their accident prevention campaigns. They encourage the formation of Safety Committees, and issue propaganda and posters for use in connection with these Committees. Posters are displayed in the works for a week at a time and replaced by fresh ones. This means of propaganda can only be regarded as an adjunct to the educational work which is continuously being carried out through foremen and works managers, and its effectiveness is largely dependent upon their good will and enthusiasm. A number of local Committees have been formed under the National Safety First Association which are useful for the interchange of experience among groups of firms and as a means of intensive education in "Safety First" principles. Local Committees, however, do not exist in all industrial centres, but member firms are kept in touch with the movement through the Association's headquarters. An Industrial Safety Bulletin is issued monthly to members of the Association as a means of bringing to their notice any new developments connected with industrial safety, and the office also serves as a bureau of information to members of the Association and subscribers to the Bulletin.

Free talks for workers are arranged by the Industrial Health Education Society, who issue a list of talks, among which is one on Eye Troubles, and offer them to workers' organisations. A list of those which have accepted these talks is given in the Annual Report of the Society. These include Trade Councils, Local Branches of the National Union of Railwaymen, Co-operative Guilds, organisations of Transport Workers, Shop Assistants, and Engineers.

The Industrial Welfare Society also organise lectures on matters affecting workers in industry. These are mainly delivered to representatives of member firms, and in 1934 included an address on Eye Injuries in Industry.

A short account of some methods of accident prevention in America is contained in Appendix XI. to this Report, and information with regard to safety regulations in Germany, Denmark, and Switzerland is given in Appendix X.

### Early and Efficient Treatment of Eye Injuries.

It is highly desirable that proper medical attention should be sought immediately for all eye injuries, as those which may seem to be trivial may eventually turn out to be serious. The

Home Office recommend (Form 923, issued November, 1934) the immediate reference for competent medical attention of any case in which a foreign body cannot be removed from the eye by a camel's hair brush which is kept in a solution the formula for which is given below.*

Efficient "First Aid" is of peculiar importance in coal mines and in other places which are at some distance from specialist medical advice. The Departmental Committee of 1922 dealt with first aid in mines in paragraphs 244 to 249 of their Report. In paragraph 248 they made the following recommendation:—

> "The Mines Department should require all ambulance stations, above and below ground, to be provided with equipment for the first-aid treatment of eye injuries, and should take steps to ensure that all cases of eye injury receive adequate first-aid treatment at the earliest possible moment."

Regulations dated 11th February, 1930, were made by the Board of Trade in pursuance of Sections 85 and 86 of the Coal Mines Act, 1911, and under the provisions of the Mining Industry Act, 1920, which require that at every mine adequate arrangements shall be made in the prescribed manner for rendering first-aid treatment to any person in or about the mine who may be injured or taken ill. The first aid equipment, whether a first-aid room is provided or not, must include sterilised dressings and a bottle of Eye Drops No. 1.*

Safety Pamphlet No. 7, issued by the Mines Department in 1935 and entitled "First Aid at Mines," includes in the Medical Notes, under the heading of "Eye Injuries," the following statement:—

> "Eye injuries fall roughly into two groups: (*a*) where a foreign body, such as a small fragment of flint, steel, coal or stone strikes the eyeball and becomes embedded therein; and (*b*) where the eye is involved in a serious injury to the face. In both cases all that should be done underground is to place a small dressing (4 inches by 3 inches) over the eye and send the man to the

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* Dispensed according to the formula set out in Form 923 ("Treatment of Minor Injuries") issued by the Factory Department of the Home Office, November, 1934.

Eye Drops:

| | |
|---|---|
| Cocaine ... ... ... ... ... ... | 0·5 per cent. |
| Hyd. Perchlor. in Castor Oil ... ... ... | 1 in 3,000 |

Instructions to chemist for making eye drops:—Weigh 95 grammes of castor oil into a flask capable of holding twice the quantity. Add 0·5 gramme of powdered cocaine. Warm on a water bath till dissolved. While the solution is still warm (but not hot) add one cubic centimetre of a solution containing 3·3 grammes of mercuric chloride in 100 cubic centimetres of absolute alcohol. Mix the solutions by rotating the flask.

About half an ounce, or 15 c.c., of this solution should be supplied in a bottle, from the cork of which a camel-hair brush is pendent in the fluid.

surface. Here the eye may be further examined, and Eye Drops No. 1 applied:* the case should then be sent for expert medical treatment."

### Illumination.

127. Though defective illumination is liable to have a serious effect upon vision, is responsible for miners' nystagmus, and conduces to the increase of myopia, there is no evidence that it alone is a cause of blindness. Perhaps the most important indirect effect of defective illumination is in its undoubted influence on the causation of accidents.

The proper illumination of factories and workshops is receiving considerable attention by the Home Office, and is the subject of their Welfare Pamphlet No. 7, entitled "Lighting in Factories and Workshops."

## Home Office Industrial Museum.

128. The Home Office Industrial Museum, 97, Horseferry Road, London, S.W.1, is open to the public from 10 to 4 on weekdays, and those who wish to see and to obtain advice upon protective measures in industry will find a number of useful exhibits and an official willing to assist in providing a solution of difficulties. All the safety devices recommended in the Museum are in actual use in some industry, and have been proved by experience to be satisfactory. The exhibits relating to eye accidents and their prevention include various types of goggles and masks and protective screens for use on abrasive wheels. There is also a welfare section, with ambulance rooms and first-aid equipment, and a lighting section in which the principles of correct illumination for various processes can be demonstrated.

A descriptive account and catalogue of the Museum and exhibits, with explanatory notes and a number of photographic illustrations, is published at 4*s*. by H.M. Stationery Office.

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* *See* foot-note, page 76.

## CHAPTER V.

# SUMMARY AND RECOMMENDATIONS.

129. An endeavour has been made in the foregoing chapters to review past and present measures directed towards the prevention of blindness. We now summarise our recommendations for rendering existing methods more effective, and make suggestions for the future in Chapter VI.

**Training of Medical Men.**

130. We are satisfied that the present arrangements do not secure that, in general, the medical practitioner has the requisite knowledge of ophthalmology, and consider that the matter should continue to receive the close attention of the Curriculum Committee of the General Medical Council. (*See* page 6.)

**Statistical Records.**

131. We believe it is important that all statistical records should be based upon the report of specialists in ophthalmology, and that a common standard should be applied. (*See* page 9.)

**The Eye in Health and Disease.**

132. (*a*) A study of myopia in its relation to the ophthalmic standards for the selection of children to attend special schools for the partially sighted is made in Chapter II. of the Report of the Committee of Enquiry into Problems relating to Partially-Sighted Children (page 16). We agree with the standards laid down by that Committee. (*See* page 15.)

(*b*) It is essential that squint and the amblyopia associated with it be treated as early as possible. (*See* page 16.)

(*c*) Phlyctenular disease mainly occurs in delicate children of school age living in unsatisfactory home conditions . . . . Improvement in children's surroundings and early treatment, particularly in open-air schools, markedly reduce the ravages of this disease. (*See* page 18.)

(*d*) Sympathetic ophthalmia . . . . must still be reckoned with as a serious danger especially when a foreign body has perforated the eye and is retained within the globe, or when what is known as the "ciliary region" has been affected. Children are peculiarly susceptible. The outlook in such cases is always serious, and it still seems necessary to emphasise the importance of removing immediately an eye which has been so seriously injured that there is no possibility of retaining any useful sight in it. (*See* page 20.)

(*e*) Glaucoma is a disease which in its chronic form proceeds so insidiously that it may pass unnoticed for years unless the eyes are properly examined. (*See* page 21.)

(*f*) Fortunately, in most cases of cataract the operation for removal results in the restoration of good vision in the absence of other defects. Infants bear the operation well; age is no bar, and successful restoration of vision has taken place after operation in patients over ninety years of age. (*See* page 22.)

**Ascertainment and Treatment of Eye Conditions.**

*A.—Ante-Natal.*

133. (i.) From the point of view of preventing blindness, we cannot overrate the importance of a comprehensive and adequate system of ante-natal supervision as a means of safeguarding the eyesight of both mother and child. (*See* page 33.)

(ii.) We hope that the importance of arranging and maintaining close liaison between the ante-natal work of an authority and the centres or clinics for the treatment of venereal disease will become generally realised as time goes on. (*See* page 34.)

(iii.) An examination of the various methods employed by Public Health Authorities has led us to the conclusion that where it is possible to arrange for women and children to receive treatment for venereal disease at a clinic in association with a Maternity and Child Welfare Clinic rather than at the recognised venereal disease centre, such an arrangement is desirable. (*See* page 34.)

*B.—Infancy.*

**Ophthalmia Neonatorum.**

(i.) We cannot too strongly emphasise the fact that Ophthalmia Neonatorum is not always venereal in origin, and therefore should not be regarded as

necessarily carrying with it the stigma of venereal disease. Other infections may produce equally serious results, as was pointed out in the 1922 Report of the Departmental Committee. (*See* page 37.)

(ii.) Ophthalmia Neonatorum requires such constant attention and such skilled nursing that by far the most satisfactory way of dealing with these cases, more particularly in areas where specialist nursing is not available, is in hospital wards, where they will receive the constant attention of skilled nursing. The ideal arrangement is to admit the mother and child together. (*See* page 39.)

(iii.) We emphasise the vital importance of securing that an ophthalmic surgeon be available at all hospitals admitting cases of Ophthalmia Neonatorum. Until this is done, the treatment of Ophthalmia Neonatorum in hospital cannot be regarded as satisfactory. (*See* page 39.)

(iv.) While we are not prepared to insist on the need for the use of prophylactic drugs as a routine measure, we consider that the proper cleansing of a baby's eyes at birth is the first essential, but we are of opinion that at the present time the most efficient prophylactic treatment, over and above the proper cleansing of the eyes, is 1 per cent. silver nitrate, the proper use of which should be included in the training of every midwife. A stronger solution than 1 per cent. is not necessary, and is more likely to cause a reactionary discharge, and so lead the midwife to summon medical aid unnecessarily. The solution of nitrate of silver should be carried in a small drop bottle of such a shape as to be recognisable by touch as well as by sight, and renewed at least once a month, as it is liable to decomposition, and to become stronger, owing to evaporation, if kept for a longer period. (*See* pages 41 and 42.)

*C.—Pre-School.*

(i.) Some authorities have instituted a system of medical examination of children at three or four years of age . . . . This system appears to have met with sufficient success to justify its continuance as a recognised procedure. (*See* page 43.)

(ii.) The arrangement whereby some authorities utilise (by agreement between the Maternity and Child Welfare and Education Departments) the services

of the school clinic and of the ophthalmic surgeon attending there, for the examination of children under school age, commends itself to us as an economical and desirable arrangement, and one which is capable of further expansion. (*See* page 43.)

(iii.) The treatment of external eye conditions at the Minor Ailments Clinics designed for children of school age should be made available to pre-school children. (*See* page 43.)

(iv.) Our review of such preventive measures as exist to safeguard the eyes of children between one and five suggests that a critical survey, by the responsible Medical Officer of Health, of his scheme for the pre-school child, especially with regard to the early diagnosis and treatment of serious eye defects, might be fruitful in results. (*See* page 44.)

(v.) We have already recommended that the service of an eye specialist should be available for isolation hospitals, but we repeat it in relation to cases of measles, where, owing to the possibility of serious eye trouble accompanying or resulting from that disease, the provision of expert ophthalmic supervision must be strongly advocated. (*See* page 44.)

*D.—School Age.*

**(i.) Ascertainment of Children with Visual Defects and Eye Disease.**

We are of opinion that the Board of Education should encourage School Medical Officers to investigate the practicability of making an examination of the visual conditions of children as soon as possible after their entry into school. In making this recommendation we find ourselves in agreement with the Report on Problems relating to Partially-Sighted Children and the Report on the Health of the School Child (1931). (*See* page 45.)

**(ii.) Treatment of Children with Visual Defects.**

(*a*) We consider that the *minimum* requirement for a satisfactory scheme should be an arrangement by which the Local Education Authority can refer to an ophthalmic surgeon all children whose cases present difficulty to the examining medical officer. (*See* page 45.)

(*b*) We are in agreement with the conclusion stated on page 156 of the Report on Partially-Sighted Children " the influence of myopia in causing

blindness and the part played by the special school in preventing such blindness is the most important of all problems with regard to myopia which needs further consideration." (*See* page 45.)

**(iii.) Treatment of Children with Eye Disease.**

(*a*) We believe that in order to get the best results the treatment of eye disease at clinics should be carried out under the supervision of an ophthalmic surgeon. (*See* page 46.)

(*b*) Arrangements for the treatment of children suffering from venereal diseases are referred to in paragraph 63 (*see* also paragraph 133 (A.) (iii.)), and we suggest that the recommendation made therein should apply not only to women and young children, but to children of all ages. (*See* page 79.)

### *E.—Adolescence and Adult Life.*

**(i.) Partially-Sighted Children.**

(*a*) There may be serious progression in the degree of myopia during adolescence, and supervision by an ophthalmic surgeon after the child leaves school may be an important factor in diminishing the risk of subsequent blindness. (*See* page 47.)

(*b*) We wish to endorse the recommendation made by the Committee on Partially-Sighted Children with regard to the power of Local Authorities to establish schemes for the ophthalmic supervision of partially-sighted children on leaving the special school, with the rider that the arrangements they suggest should also apply to all children with serious eye defects on leaving the ordinary elementary school. (*See* page 48.)

**(ii.) Entrants to Industry.**

Some large firms have established medical departments and organised medical examinations of all young persons entering their factories. In connection with all such arrangements, we suggest that the eyes should be examined by ophthalmic surgeons. (*See* page 49.)

**(iii.) Notification of Persons threatened with Blindness.**

One County Council have incorporated in their scheme for prevention of blindness made under Section 66 of the Public Health Act, 1925, a clause providing for the voluntary notification by medical practitioners, or otherwise, of persons threatened with blindness. Although it is too soon to assess

the value of this experiment, we have included this clause in the draft Model Scheme at the end of Chapter III., and commend it to the consideration of Local Authorities. (*See* page 49.)

**(iv.) Follow-up Service for Hospital Cases.**

(*a*) We are of opinion that there are strong arguments for a special development of their Almoners' Service of "follow-up" work by Eye Hospitals and Hospitals with Ophthalmic Departments. (*See* page 52.)

(*b*) A system of "follow-up" work for ophthalmic cases, which includes outdoor visiting where necessary, could readily be organised through the existing social service department of a voluntary hospital. The work should be part of the Almoners' Department, and should be undertaken either by the Lady Almoner herself or by workers under her supervision. (*See* page 52.)

**(v.) Provision of Ophthalmic Benefit by Approved Societies under National Health Insurance Scheme.**

From the point of view of the prevention of blindness, it is of the first importance that everyone suffering from disease of the eye should be examined by an ophthalmic surgeon. (*See* page 54.)

**Occupational Blindness.**

(*a*) *Miners' Nystagmus.*

134. Miners' Nystagmus is not a cause of blindness, and, although it is a temporary handicap to work underground, it does not come within our province. We agree, however, with the view expressed by the Third Report of the Miners' Nystagmus Committee (1932), that it is highly desirable to keep the men in employment above ground. (*See* page 61.)

(*b*) *Factories and Workshops.*

(i.) The greatest risk to the eye occurs in metal working, in chemical processes through the splashing of chemicals, and in stone dressing. The obvious way of protecting the eye is either by wearing some kind of eye protection or by the provision of a screen fixed to the machine, the work

or the work-bench to stop flying particles. (*See* page 66.)

(iii.) The majority of flying shuttle accidents occur in the cotton industry, and this danger has been met by voluntary regulations in the cotton trade requiring the provision of shuttle guards. (*See* page 66.)

(iv.) There are, however, certain genuine reasons, quite apart from prejudice, for the widespread objection to wearing goggles when their use is not compulsory. Among these reasons are:—

Bad design and fit.

This could be remedied if goggles were specially designed for special processes and were supplied in a variety of sizes so that a selection could be made by the individual workman. (*See* page 68.)

Lack of ventilation, which makes the goggles hot to wear and causes them to fog, thus restricting vision and impairing efficiency.

The absence of side pieces, where these are not absolutely necessary, will solve the problem of ventilation, but there are other causes of dimmed or restricted vision which may have to be taken into account. (*See* page 69.)

Certain processes, such as welding, cause the special glass to become heavily pitted, and in a short time vision becomes so restricted that this glass must either be replaced or the goggles discarded.

All goggles should be so constructed that the replacing of the glass is a simple matter; and the best types of welders' goggles are now fitted with a cover-slip of ordinary glass which is cheap and can easily be replaced, and which protects the special welders' glass from becoming pitted in use. We are of opinion that investigation with regard to the best type of goggles for other processes might with advantage be undertaken by an appropriate body and specifications prepared. (*See* page 69.)

Some workers complain of eye strain from using goggles.

This complaint is most likely to be made by men whose vision is already poor, but may sometimes

be due to the goggles being fitted with concave instead of plane glass, an error which is liable to be found in cheaply produced goggles. (*See* page 69.)

(v.) We consider that there is a future for the gauze veil in all those processes where it has been found efficient. (*See* page 70.)

(*c*) *Mines and Quarries.*

(i.) The risk of eye accidents is peculiarly heavy in coal mines and in quarries raising igneous rocks. The drawbacks to wearing goggles in coal mines should expedite the search for a more satisfactory form of eye protection than the types of goggles fitted with gauze wire or with unsplinterable glass. (*See* page 71.)

(ii.) Efficient " first aid " is of peculiar importance in coal mines and in other places which are at some distance from specialist medical advice. (*See* page 70.)

(iii.) The wearing of goggles in quarries is open to fewer objections than in coal mines, owing to the difference in the working conditions, so long as they do not restrict vision. We endorse the recommendation of the 1922 Departmental Committee " that the Mines Department should endeavour to extend the use of goggles in quarries, and for that purpose enlist the aid of the workmen's and other organisations." (*See* page 71.)

(*d*) *Early and Efficient Treatment of Eye Injuries.*

It is highly desirable that proper medical attention should be sought immediately for all eye injuries, as those which may seem to be trivial may eventually turn out to be serious. (*See* page 75.)

(*e*) *Agricultural and Other Occupations.*

Lack of expert attention (in agricultural accidents) is particularly serious because of the special risk of infection due to the nature of such injuries. Every effort should be made to seek medical help without loss of time. (*See* page 63.)

Road-making, and the processes it involves, are also occupations in which there are no legal enactments for the prevention of accidents . . . . Roads are

under the control of the Highway Authorities, and if the attention of the Authorities were drawn to the risks to which these workers are exposed, they would, no doubt, be willing to make every effort to reduce such risks. Local Authorities might consider using their powers for the prevention of blindness (under Section 66 of the Public Health Act, 1925), for the protection of these workers. (*See* page 64.)

*(f) Safety Committees, &c.*

Another experiment which has been started by a Safety Committee is a class of instruction for young workers in safety principles and first aid. In view of the large proportion of accidents among young persons as compared with adults (discussed at some length in the Chief Inspector's presentation of his 1934 Report) an extension of such classes appears desirable. (*See* page 74.)

**Hereditary Blindness.**

Unless there is medical evidence to show that the case does not fall within the hereditary class, a blind person contemplating marriage should seek the advice of a competent ophthalmologist before marriage, in view of the complex nature of the problem and the serious handicap imposed upon the children of persons suffering from inheritable eye disease. The ophthalmologist will no doubt obtain a pedigree and, if necessary, consult a genetic expert. (*See* " Foreword.")

## CHAPTER VI.

# SUGGESTIONS FOR THE FUTURE.

135. The recommendations contained in the Report of the Departmental Committee on the Causes and Prevention of Blindness (1922), to which we have frequently referred in preceding chapters, would have been enhanced in value if at that time there had been in existence a particular organisation with prevention of blindness as its primary object. Neither the Welfare of the Blind Department of the Ministry of Health nor the agencies responsible for the care of blind persons are primarily concerned with the prevention of blindness, and monies given for the relief of the blind under the provisions of the Blind Persons Act, 1920, cannot be used for this purpose. The Departmental Committee's Report, therefore, was effective only where it aroused sufficient interest to lead to action, but, although the interest was widespread, any preventive measures resulting from it were largely owing to the enthusiasm of individuals or groups of individuals.

To arouse a consciousness of the need for action is a first step towards action being taken. An effective campaign for the prevention of blindness must be based (*a*) on the results of research, *i.e.*, the increase of knowledge of the causes of blindness, their prevention and treatment; and (*b*) on propaganda, *i.e.*, the dissemination of such knowledge in an intelligible form.

136. In the early part of this Report (paragraphs 16 to 22) we have stressed the importance of the principle, recognised by expert committees and individuals who have investigated the subject, that any measures advocated for the prevention of blindness must be founded on comprehensive statistics compiled on a uniform basis and subjected to uniform classification and analysis. As we have stated in paragraph 20, a special form of report and certificate for the examination of blind persons has been recommended by the Minister of Health and the Board of Education for general adoption, and is now being used by the majority of Local Authorities in England and Wales. Copies of these forms are submitted to us for examination, and our Specialist Sub-Committee have already scrutinised large numbers. The results are not yet available, and much still remains to be done before the Sub-Committee are in a position to report.

When the process of examination is completed, it will be necessary to make a detailed analysis of the information so obtained, which should throw light, not only on the general

causes of blindness but possibly also on the incidence of particular forms of blindness in different localities. This preliminary investigation may prove to be but the first stage in further research. It may point the way along which further statistical enquiries must be made, and may indicate lines on which expert medical investigation should be carried out.

137. In Chapter II. of this Report reference has already been made, in dealing with particular diseases, to the need for further research along certain lines. As we have stated in paragraph 28, much remains to be done in differentiating between the dangerous and relatively safe forms of myopia. Another matter which calls for comprehensive investigation is what part, if any, is played by faulty nutrition in the production of the former.

138. The problem presented by measles is twofold; firstly, the prevention of the disease itself; and, secondly, the prevention and treatment of the ocular complications of the disease. Research is now being carried out by epidemiologists on the first problem. With regard to the second, it seems to us important to ascertain (*a*) the nature of the eye condition that caused the blindness; (*b*) at what stage in the disease the eyes became affected; (*c*) the kinds of treatment adopted; whether the child was treated at home or in hospital, if an ophthalmic surgeon was consulted, and, if so, at what stage of the disease.

139. In the case of blindness attributed to congenital (infantile) cataract where an operation has been carried out, it is important to ascertain if the blindness is in fact due to the cataract or to (*a*) other associated ocular defects; (*b*) post-operative complications; (*c*) delayed operation; (*d*) lack of special facilities for "teaching the child to see" after the operation; this is of special importance for children with mental retardation, a condition which is often associated with congenital cataract.

140. Another result of this investigation may be to suggest some modification of the present form of report and certificate, but this is a matter which must be considered, not only in relation to the needs of this country but also to the steps taken in other countries to secure uniformity of classification. We would emphasise the desirability of maintaining as close a touch as possible with other countries engaged in investigating the causes of blindness and the most effective methods of prevention.

141. Apart from the general questions with which we have dealt in this Report, it should also be mentioned that special matters have from time to time been referred by the Ministry

of Health and by the Board of Education to the Committee for investigation; for example, the standard illumination of test types to be used in the examination of the vision of candidates for admission to the register of blind persons, and the ophthalmic standards for the definition of blindness in children (*see* Appendix III. (*a*)). It seems to us that valuable results may be achieved if questions relating to the prevention of blindness can be referred to an expert Committee by Government Departments, Local Authorities and agencies concerned with the welfare of the blind.

142. Another matter which may well occupy the attention of a specialist Committee in the near future is an examination of the results of the arrangements made by Local Authorities for the prevention of blindness under Section 66 of the Public Health Act, 1925 (*see* Chapter III., paragraph 121). By appraising the value of such arrangements, the Committee should be in a position to frame further recommendations and to assist in their promotion.

143. The acquisition of further knowledge of the causes of blindness is not in itself sufficient, but must be followed up by adequate arrangements for bringing to the notice of the public the means which should be taken (*a*) to prevent the occurrence of eye diseases and eye injuries; or (*b*) to obtain the necessary treatment to minimise the results of such diseases and injuries.

We are of opinion that, to be effective, the dissemination of such knowledge should be carried out both nationally and locally. However the necessary publicity may be achieved, it is essential that the subject-matter should be approved by a body to whom the advice of ophthalmic surgeons is constantly available.

Direct power to disseminate information on health is given to Local Authorities under the provisions of Section 67 of the Public Health Act, 1925, which are as follows:—

> " (1) Any Local Authority or County Council may arrange for the publication within their area of information on questions relating to health or disease, and for the delivery of lectures and the display of pictures in which such questions are dealt with, and may defray the whole or a portion of expenses incurred for any of the purposes of this section.
>
> (2) The Minister of Health may, for the purposes of this section, make rules prescribing restrictions or conditions subject to which the powers conferred by the section may be exercised."

This section does not apply to the London County Council, but similar powers were given to that Council by their General Powers Act of 1926. The Minister has not yet made any rules under Sub-section (2) of Section 67.

If Local Authorities could be shown that the proper exercise of these powers might well lead to a decrease in the number of cases of blindness and a reduction of unremunerative expenditure, we have no doubt that they would be willing to make full use of these powers, and to co-operate for this purpose with other Local Authorities and with Voluntary Agencies where such co-operation would lead to greater efficiency. We would strongly recommend that where any special arrangements are made for the purpose of spreading information on the subject of health, the prevention of blindness should always receive special consideration.

144. If the campaign for the prevention of blindness is to achieve its object, there must be an authoritative body whose primary functions will be: (1) to classify and collate the statistical information placed at its disposal; (2) to advise what further statistical information should be obtained; (3) to indicate in what directions and upon what lines further research should be carried out; (4) to examine and collate the results of research; (5) to advise on propaganda; (6) to advise Government Departments, Local Authorities and agencies concerned with the welfare of the blind on questions referred by them; and (7) to receive from, collate and circulate to, representative bodies in other countries information on the prevention of blindness.

The body to carry out these functions should be in the nature of a Standing Committee on the Prevention of Blindness, so constituted as to secure continuity of its work and the constant services of ophthalmic surgeons of repute. Up to the present time these conditions have been fulfilled in the constitution of our Committee, which has had the advantage of surveying the whole field of prevention of blindness in this country. We therefore feel it is incumbent upon us to express our willingness to carry on the work which has been entrusted to us in the past, if the necessary financial arrangements can be made. We regard the matter as one of urgent importance, not only in the interest of those already threatened with blindness but also in relation to the welfare of the whole community.

Signed, on behalf of the

Prevention of Blindness Committee,

P. M. EVANS.

(*Chairman*).

*April*, 1936.

# APPENDIX I.

## Follow-up Service for Hospital Cases in America.

The value of a " follow-up " service as applied to eye work has been recognised for a considerable time in America. Miss Amy G. Smith, Chief Worker of the Medical Social Service Department of the Massachusetts Eye and Ear Infirmary, Boston, wrote in 1933: " When a Social Service Department was started at the Massachusetts Eye and Ear Infirmary in 1907, it was with a distinct emphasis upon prevention of blindness. The social worker who had been chosen to start the work, under the guidance of the Chief of the Eye Service, selected a group of eye diseases in which all the patients coming to the clinic would be followed. This was in line with the belief expressed by all authorities on the subject of prevention of blindness that failure to return for treatment was the cause of much preventable blindness."

The late Dr. George S. Derby, of Boston, at that time Chief of the Eye Department, in a paper contributed to the *American Journal of Ophthalmology* in 1932, asserted " that of all the developments of ophthalmic practice as applied to hospitals which have taken place during the past twenty-five years, this is by far the most important."

By 1923 the Social Service Department of the Massachusetts Eye and Ear Infirmary included five eye case workers and one general follow-up worker. It was realised, however, that much valuable work could be done to conserve vision by concentrating attention on a large number of glaucoma patients, and through Dr. Derby's keen interest in the study of glaucoma and his position as a director of the National Society for the Prevention of Blindness, New York, this Society agreed, in 1928, to place a medical social worker in the clinic of the Massachusetts Eye and Ear Infirmary on a demonstration basis, solely to follow up cases of glaucoma. The success of the experiment led the National Society to participate, in 1931, in the establishment of an experimental training course to be carried out in the Social Service Department of the Massachusetts Eye and Ear Infirmary.

In the course of an article, published in 1932 in the *Sight Saving Review* (the organ of the National Society for the Prevention of Blindness), on " The importance of Society Service and follow up in preventing Blindness," Dr. Conrad Berens wrote: " The first question will probably be ' Why have a follow-up system?' If the patient wants to come back, he will come back ; if not, he will stay away. This, however, is not true in practice because it has been found that before follow-up systems were instituted, from 50 to 75 per cent. of the patients failed to return after the first visit. With the follow-up system, the number of patients who failed to return is reduced to 20 per cent. or less in most clinics."

A verbal account of the progress of Medical Social Service in the United States of America since that date was given to us in May, 1934, by Dr. Lewis H. Carris, Managing Director of the National Society for the Prevention of Blindness. Dr. Carris stated that, through scholarships and grants, the Society had assisted in the training of a number of medical social workers for eye service, and upwards of twenty workers had been placed in various hospitals in New York City, in St. Louis, New Orleans, Philadelphia, Denver, and other centres. The posts are salaried, and the services rendered appear on the social side to be comparable with those undertaken by lady almoners in Great Britain.

## APPENDIX II.

*(Form recommended in Circular* 1353, *Ministry of Health, reprinted by kind permission of the Controller, H.M. Stationery Office.)*

**Form B.D. 8**

**STRICTLY PRIVATE AND CONFIDENTIAL.**

*County (Borough) of*.....

# Examination for Admission to Register of Blind Persons.

*Name of Person Examined*..... *Sex*.....

*Occupation (Specify, with dates)*..... *Date of Birth*.....

*Previous Occupations (Specify, with dates)*.....

*Address*.....

This section should be completed before forwarding to the Ophthalmic Surgeon.

## EXAMINATION OF EYES.

NOTE.—The answers to questions in Sections 2 and 3 are required in order that reliable information may be obtained as to the causes of blindness with a view to assisting in devising appropriate measures for its prevention. It is therefore of importance that great care should be taken in making these replies as accurate as possible, and that entries should be made for each eye.

It is intended that Section 2 should be confined to a record of what the ophthalmologist actually finds in examining the eyes, and Section 3 should state as far as possible the causes to which these conditions are attributable, *e.g.*, if the examination shows interstitial keratitis caused by syphilis " interstitial keratitis " should be entered under " Cornea " in Section 2 (*e*), and " syphilis " under Section 3 B (3).

The findings in Sections 2 and 3 should be entered in Section 6.

| | Right Eye. | Left Eye. |
|---|---|---|
| **1.—HISTORY OF CASE.** | | |
| (*a*) Age at onset of eye trouble which led to blindness ... ... ... | ..... | ..... |
| (*b*) Age at onset of blindness ... ... ... ... ... ... ... | ..... | ..... |
| **2.—PHYSICAL EXAMINATION OF THE EYES.** | | |
| (*a*) Visual Acuity— | | |
| (i.) Unaided ... ... ... ... ... ... ... ... ... | ..... | ..... |
| (ii.) With focus properly corrected ... ... ... ... ... ... | ..... | ..... |
| (iii.) Both eyes together unaided ..... | | |
| (iv.) Both eyes together with focus properly corrected ..... | | |

(*b*) Generally age at which applicant was unable to follow usual occupation on account of eye trouble.

| | * Right Eye. | * Left Eye. |
|---|---|---|
| (*b*) Field of vision ... ... ... ... | (i.) Good<br>(ii.) Contracted<br>(iii.) Less than 10°<br>(iv.) Central Scotoma<br>(v.) Hemianopia<br>(vi.) Nil | (i.) Good<br>(ii.) Contracted<br>(iii.) Less than 10°<br>(iv.) Central Scotoma<br>(v.) Hemianopia<br>(vi.) Nil |
| * (*Please underline appropriate condition.*) | | |
| (*c*) Globe (tension, muscles, *e.g.*, squint, nystagmus, &c.) ... ... ... ... ... | ..... | ..... |
| (*d*) Lids ... ... ... ... ... | ..... | ..... |
| (*e*) Cornea ... ... ... ... ... | ..... | ..... |
| (*f*) Iris ... ... ... ... ... ... | ..... | ..... |
| (*g*) Ciliary body ... ... ... ... | ..... | ..... |
| (*h*) Lens ... ... ... ... ... | ..... | ..... |
| (*j*) Vitreous ... ... ... ... ... | ..... | ..... |
| (*k*) Retina ... ... ... ... ... | ..... | ..... |
| (*l*) Choroid ... ... ... ... ... | ..... | ..... |
| (*m*) Optic nerve ... ... ... ... | ..... | ..... |

(*n*) Prognosis .....

(*o*) Is re-examination for any reason desirable? If so, when? .....

3.—**CAUSES OF EYE DEFECTS** (as ascertained in 2, see marginal note).

The appropriate cause or causes of the condition found in Section 2 should be underlined in this Section 3, indicating for each eye the main cause with the figure (1), and other cause, if any, with the figure (2).

| | Left Eye. | Right Eye. |
|---|---|---|
| **A.—Congenital and Undetermined Causes—** | | |
| (1) Congenital, hereditary and developmental defects ... ... ... ... ... ... ... | ..... | ..... |
| (2) Myopic error ... ... ... ... ... ... ... ... ... ... ... ... | ..... | ..... |
| (3) Other errors of refraction. (Specify)... ... ... ... ... ... ... ... ... | ..... | ..... |
| (4) Glaucoma, primary ... ... ... ... ... ... ... ... ... ... ... | ..... | ..... |
| (5) Cataract, primary ... ... ... ... ... ... ... ... ... ... ... | ..... | ..... |
| (6) Other primary ocular defects, *e.g.*, primary detachment of retina. (Specify)..... | ..... | ..... |
| (7) Tumour—intra-ocular ... ... ... ... ... ... ... ... ... ... ... | ..... | ..... |
| (8) Tumour—adnexa ... ... ... ... ... ... ... ... ... ... ... | ..... | ..... |
| (9) Other, *e.g.*, amblyopia ex anopsia, &c. (Specify)..... | ..... | ..... |
| **B.—Infectious and Bacterial.** | | |
| (1) Ophthalmia Neonatorum ... ... ... ... ... ... ... ... ... ... ... | ..... | ..... |
| (2) Gonorrhœa ... ... ... ... ... ... ... ... ... ... ... | ..... | ..... |
| (3) Syphilis— | | |
| (*a*) Congenital ... ... ... ... ... ... ... ... ... ... ... | ..... | ..... |
| (*b*) Acquired ... ... ... ... ... ... ... ... ... ... ... | ..... | ..... |
| (4) Trachoma ... ... ... ... ... ... ... ... ... ... ... | ..... | ..... |
| (5) Local infection of coats of eye ... ... ... ... ... ... ... ... ... ... | ..... | ..... |
| (6) Specific Fevers, *e.g.*, smallpox, measles, scarlet, diphtheria. (Specify)..... | ..... | ..... |
| (7) Meningitis—cerebro-spinal and other non-tuberculous forms. (Specify)..... | ..... | ..... |
| (8) Tuberculosis ... ... ... ... ... ... ... ... ... ... ... | ..... | ..... |
| (9) Eczematous kerato-conjunctivitis, *e.g.*, phlyctenular, &c., not definitely tuberculous... ... | ..... | ..... |
| (10) Septicæmia, acute ... ... ... ... ... ... ... ... ... ... ... | ..... | ..... |
| (11) Septicæmia, chronic ; auto-toxic, focal sepsis ... ... ... ... ... ... ... | ..... | ..... |
| (12) Other infectious and bacterial diseases. (Specify)..... | ..... | ..... |

Ophthalmic surgeons should complete as much of Sections C. and D. as may be possible with the information at their disposal, as particularly as they are able.

**C.—Traumatic and Chemical—**

(1) Industrial—

(*a*) Trauma.

Cause.....

Trade.....

Process.....

(*b*) Industrial disease.

Cause.....

Trade.....

Process.....

(2) Non-industrial—

(*a*) Trauma.....

.....

(*b*) Systemic poisoning, *e.g.*, tobacco, alcohol, lead, arsenic, thallium, &c. (State precise cause).....

(*c*) Birth trauma ... ... ... ... ... ... ... ... ... ... ...

(*d*) War trauma ... ... ... ... ... ... ... ... ... ... ...

(3) Indirect: sympathetic ophthalmia ... ... ... ... ... ... ... ... ...

(4) Trauma (category not ascertainable) ... ... ... ... ... ... ... ...

**D.—General Diseases—**

(1) Anæmia and other blood diseases. (Specify).....

(2) Vascular diseases, including cerebral vascular lesions. (Specify).....

(3) Diseases of the central nervous system (except meningitis and those mentioned at (4) and (5) below). (Specify).....

(4) Diseases connected with disorders of pregnancy and childbirth, *e.g.*, eclampsia. (Specify).....

(5) Intracranial neoplasm ... ... ... ... ... ... ... ... ... ... ...

(6) Diabetes ... ... ... ... ... ... ... ... ... ... ... ... ...

(7) Nephritis ... ... ... ... ... ... ... ... ... ... ... ... ...

(8) Other general diseases. (Specify).....

**E.—No information obtainable.**

Appendix II.—(*contd.*).

**4.—REMARKS,** *e.g.*, Family history, &c

It is specially desirable that in cases where it is applicable (Leber's Disease, Tay - Sach's Disease, Retinitis Pigmentosa, and Allied Diseases, High Myopia, &c.) as much information as possible regarding relatives who are blind or who have seriously defective vision should be detailed. In all cases of disease which may be of genetic origin it is particularly requested that a definite statement shall be made as to whether or no any relatives have been known to be similarly affected, and whether the parents of the individual were or were not consanguineous. This space should, if possible, not be left blank.



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(*Please UNDERLINE the words which apply in this Section* 5.)

**5.—OTHER MENTAL, NERVOUS OR PHYSICAL DISABILITY (IF ANY) IN ADDITION TO BLINDNESS, e.g.—**

It is hoped that Ophthalmic Surgeons will complete as much of this Section as may be possible with the information at their disposal.

(1) Mental defect.

(2) Epilepsy.

(3) Deafness.

(4) Deaf-mutism.

(5) Crippling defects, bones, joints, spinal, etc. (Specify).....

(6) Other. (Specify).....

---

Enter in this Section the appropriate letters and numbers from Sections 2 and 3, *e.g.*, in a case of Retinitis with Optic Atrophy the certifying Ophthalmic Surgeon might underline in Section 2 (*b*) Field of Vision ii. Contracted, also (*k*) Retina and (*m*) Optic Nerve, and complete Section 6 (A) thus:—

Eye defects found:
(1) *k* (1) *k*
(2) *m* (2) *m*
(3) *b* ii. (3) *b* ii.

The appropriate letters and numbers from Section 3 will be entered in Section 6 (B).

## 6.—DIAGNOSIS AND SUMMARY OF CASE.

| | | Right Eye. | Left Eye. |
|---|---|---|---|
| **A.—Eye defects found** (*see* Section 2.) | Main | (1)..... | (1)..... |
| | Other | (2)..... | (2)..... |
| | | (3)..... | (3)..... |
| **B.—Cause of eye defects** (*see* Section 3.) | Main | (1)..... | (1)..... |
| | Other | (2)..... | (2)..... |

*(Please UNDERLINE the words which apply in this Section 7.)*

## 7.—TREATMENT.

**A.—History of Institutional Treatment and Operations for Ophthalmic condition or its cause—**

(1) Not known. (3) Medical, successful. (5) Medical, uncompleted. (7) Surgical, unsuccessful.
(2) None. (4) ,, unsuccessful. (6) Surgical, successful. (8) ,, uncompleted.

**B.—History of Anti-Syphilitic Treatment—**

(1) Not known. (3) By private practitioner.
(2) Regular course at hospital or clinic. (4) Other treatment, if any (Specify).....
(5) No medical treatment.

**C.—Treatment recommended—**

(1) None. (2) Medical. (3) Surgical. (4) Optical. (5) Educational, *i.e.*, by special methods (if under 16).

**D.—Would Treatment probably remove person from blind category?**

(1) Yes. (2) No. (3) Doubtful. (4) Yes, but inadvisable on general grounds.

**E.—Is Wasserman or other serological test recommended?**

(1) Yes. (2) No. (3) Result (when known).

[*If the applicant has already had a serological test carried out, UNDERLINE* (4) *or* (5) *whichever is appropriate.*]

(4) Positive. (5) Negative.

Appendix II.—(*contd.*).

## CERTIFICATE.

(*The answers to the following questions must be YES or NO.*)

(1) Do you consider the person " so blind as to be unable to perform any work for which eyesight is essential " within the meaning of the Blind Persons Act, 1920? (NOTE.—This disability refers to *any* work and not to his or her own occupation and it must be distinct from any other disability of mind or body.) (*See* Note A.) ... .....

(2) **If the person is a child under 16—**

(*a*) Is he so blind that he can only be appropriately taught in a Special School for **blind** children? ... ... ... ... ... ... ... ... ... ..... 86

If the answer to this question is " No "—

(*b*) Has he such bad vision that he cannot read ordinary school books without risk of injury to his eyesight, or that he cannot with advantage be taught in an ordinary Elementary School, and should therefore be taught in a Special School for **partially sighted** children? (*See* Note B.) ... ... ... ... .....

(3) **If the person is a child under 16,** do you consider it likely that the child will be blind within the meaning of the Blind Persons Act, 1920, on attaining the age of 16? ... .....

(4) **If the person is 16 years of age or over** and not at present blind within the meaning of the Blind Persons Act, 1920, do you consider it likely that the person will become blind within the meaning of the Act during the next four years? (*See* Note C.) ... .....

*Address of place of Examination*.....

.....

*Signature*.....

* *Registered Medical Practitioner.*

*Date*.....19.....

* The Registered Medical Practitioner may add particulars of special ophthalmic qualifications or experience (if any).

---

NOTES.

A. Blindness within the meaning of the Blind Persons Act, 1920, means "so blind as to be unable to perform any work for which eyesight is essential" (*See* Section I. of the Blind Persons Act, 1920). The Ministry of Health have explained the criteria which should be adopted in interpreting this definition in Circular 1353 of 5th October, 1933.

B. It must be understood that children who, by means of suitable glasses, are able to read the ordinary school books used by children, without fatigue or injury to their vision, do not fall within the above categories. Children included in (2) (*b*) above must not be entered on the register of blind persons.

C. The primary object of this question is to determine whether a person not yet blind should be trained in anticipation of his becoming blind by the time the the training is complete.

## APPENDIX III.

[*Reprinted by kind permission of the Controller, H.M. Stationery Office.*]

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**Circular 1353.**

*County and County Borough Councils.*
*Common Council of the City of London.*
*Voluntary Associations for the Blind.*

MINISTRY OF HEALTH,
WHITEHALL, S.W.1.

*5th October,* 1933.

SIR,

# Certification of Blindness.

1. I am directed by the Minister of Health to say that he has had under consideration, in consultation with the Board of Education, a report on the certification of blindness recently made by the Prevention of Blindness Committee appointed by the Union of Counties Associations for the Blind, and he has also considered the views expressed on this report by a number of professional and other organisations.

2. The Minister has already set out in Circulars 681 and 780 his views as to the criteria to be adopted for determining whether or not a person satisfies the condition of blindness laid down in the Blind Persons Act, 1920. For convenience these views are restated in the Appendix to this Circular with some expansion on the lines recommended by the Committee on the advice of their professional members.

3. In paragraph 11 of Circular 1086 the Minister drew the attention of Local Authorities to the importance of securing that a person should not be registered as blind until satisfactory medical evidence of blindness is produced. It was further suggested in that paragraph that Local Authorities should consider the desirability of making arrangements for securing that before a person's name is added to the register he is examined by a medical practitioner with special experience in ophthalmology. Since the date of this Circular many Local Authorities have incorporated a clause to this effect in the schemes made by them under Section 2 of the Blind Persons Act, and others have given effect to the recommendation without making specific provision in their schemes.

4. The Committee expressed their concurrence with the Minister's recommendation and stated that their professional members considered

that the words " a medical practitioner with special experience in ophthalmology " should be taken to mean—

> " a medical practitioner who devotes his or her whole time to the practice of ophthalmology in all its branches or who is in charge of the Ophthalmic Department of a General Hospital of not less than 100 beds ; failing such practitioner, one who holds a diploma in ophthalmology from a University, the Royal Colleges of Surgeons of England and of Physicians of London, or other examining body recognised by the General Medical Council."

They added that, while there may be difficulty in some areas in finding practitioners with these qualifications, they attached so much importance to the maintenance of a high qualification as a means of securing correct and just certification that they hoped it might prove practicable to apply this definition generally.

5. The Minister is advised that the definition suggested by the Committee is generally satisfactory, but he understands that there are some medical practitioners who, while not coming within the terms of the definition, are yet, by reason of special experience in the practice of ophthalmology, fully competent to certify as to blindness. He is also aware that in some parts of the country it may be difficult to obtain the services of a practitioner possessing special qualifications. He recommends, however, that local authorities should, as far as possible, aim at securing that all certification is undertaken by practitioners having the special qualifications described above.

6. The Committee appended to their report a form of certificate which they recommended for general adoption. This form is based on one which has been used for some time by some Scottish Authorities and, since the publication of the report, it has been adopted by a number of Local Authorities in England and Wales and accepted by the County Councils Association and the Association of Municipal Corporations. After considering the representations which have been made to him, the Minister recommends that subject to some small modifications the proposed form of certificate should be adopted generally throughout England and Wales. Copies of the form (B.D. 8) incorporating these modifications are enclosed, and a further supply will be sent on application to the Ministry.

7. The form is designed to serve two purposes. While its primary function is the certification of the individual, it also provides for the recording of particulars which are essential for the compilation of statistics which should ultimately be of scientific value in the prevention of blindness. The Minister and the Board of Education have authorised the Prevention of Blindness Committee to collate such statistics, and it is understood that the Committee will be prepared to set up a specialist sub-committee to examine and classify the information and, with the approval of the Minister, to undertake, in consultation with any other specialist body (should this appear desirable), the tabulation of the statistics for the use of Local Authorities. The information will be treated as confidential, and the Minister regards it as important that a copy of each certificate given in the form proposed should be sent periodically to the Secretary of the Committee. The address is 66, Victoria Street, London, S.W.1.

8. A copy of this Circular is being sent to the Medical Officer of Health, and additional copies may be obtained from His Majesty's Stationery Office at any of the addresses shown below, or through any bookseller.

I am, Sir,
Your obedient Servant,

A. B. MACLACHLAN,
*Assistant Secretary.*

The Clerk of the Council
or
The Town Clerk
or
The Secretary to the Association.

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## APPENDIX.

### Definition of Blindness.

1. The test which has been adopted for the purposes of the Blind Persons Act, 1920, is that the person is "so blind as to be unable to perform any work for which eyesight is essential." There are two important points to be noticed, viz.:—

(i) The test is not whether the person is unable to pursue his ordinary occupation or any particular occupation, but whether he is too blind to perform *any work* for which eyesight is essential; and

(ii) Only the visual conditions are taken into account and other bodily or mental infirmities are disregarded.

2. The principal condition to be considered is the visual acuity (*i.e.*, the best direct vision obtainable with each eye separately or both together, where both are present, as tested by Snellen's type *with focus properly corrected*), but regard must also be paid to the other conditions set out below.

3. The persons examined may be classified in three groups, as follows:—

*Group* 1.—*Below* 3/60 *Snellen.*

In general a person with visual acuity below 3/60 Snellen may be regarded as blind. In many cases, however, it is desirable to test the vision at one metre and not to regard a person having acuity of 1/18 Snellen as blind unless there is also considerable restriction of the visual field.

(Note.—1/18 indicates a slightly better acuity than 3/60, but as the standard test types provide a line of letters which an eye possessed of full acuity should read at 18 metres, there is some convenience in specifying 1/18.)

*Group* 2.—3/60, *but below* 6/60 *Snellen.*

A person with visual acuity of 3/60 but less than 6/60 Snellen—

(*a*) may be regarded as blind if the field of vision is considerably contracted, but

(*b*) should not be regarded as blind if the visual defect is of long standing and is unaccompanied by any material contraction of the field of vision, *e.g.*, in cases of congenital nystagmus, albinism, myopia, etc.

*Group* 3.—6/60 *Snellen or above.*

A person with a visual acuity of 6/60 Snellen or better should ordinarily not be regarded as blind. He may, however, be regarded as blind if the field of vision is markedly contracted in the greater part of its extent, and particularly if the contraction is in the lower part of the field ; but a person suffering from homonymous or bi-temporal hemianopia retaining central visual acuity of 6/18 or better is not to be regarded as blind.

*Notes.*

(*a*) The question whether a defect of vision is recent or of long standing has a special bearing on the certification of blindness. A person whose defect is recent is less able to adapt himself to his environment than is a person with the same visual acuity whose defect has been of long standing. This is specially applicable in relation to Groups 2 and 3.

(*b*) Another factor of importance, particularly in relation to Group 2, is the age of the person at the onset of blindness. An old person with a recent failure of sight cannot adapt himself so readily as can a younger person with the same defect.

(*c*) On rare occasions cases will arise which are not precisely covered by the foregoing observations, and such cases must be dealt with according to the judgment of the certifying ophthalmic surgeon.

# APPENDIX IIIA.

## Extracts from the Annual Report of the Chief Medical Officer of the Board of Education for the Year 1933.

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Page 105.

**Ophthalmic Standards for defining Blind Children.**

The Ministry of Health in Circular 681 (1926) defined in ophthalmic terms the visual condition of persons eligible for any benefits under the Blind Persons Act as "Too blind to perform any work for which eyesight is essential." Is it possible to define in ophthalmic terms the condition of children who will in all probability be eligible for benefits under the Blind Persons Act on leaving school and who should be educated by methods applicable only to blind children? This question was referred to the Board of Education for determination by the Joint Committee of the College of Teachers of the Blind and the National Institute for the Blind on research into the education of the blind. The Board asked for assistance on this technical problem from the Prevention of Blindness Committee of the Union of Counties Associations for the Blind. This body set up a sub-committee, which included representative ophthalmic surgeons. In due course a report was submitted to the Board defining in ophthalmic terms children who should be admitted to schools for the blind and educated by methods applicable only to the blind. The report is as follows:—

"In the selection of children for admission to Blind Schools no hard-and-fast rules can be laid down, and every case should be treated on its own merits. There are, however, certain general principles which can be formulated for the guidance of the ophthalmic surgeons who are responsible for the selection of such children:—

*Visual Acuity.*—Visual acuity should be measured with both eyes open and with suitable glasses if necessary. The best test card for this purpose is the variable E card, *i.e.*, one in which the E signs can be rotated in any desired direction. This test card does not require the knowledge of letters and needs only the simplest action of imitating with the fingers the position of the limbs of the E.

*Visual Standards.*—(1) A child who has visual acuity (with correction) of less than 6/60 should go to a blind school.

(2) A child who has visual acuity (with correction) of 6/60 or better *may* need to go to a blind school if he has—

(*a*) nystagmus, associated with

(i) defects in the media ;
(ii) defects in the coats of the eye.

(*b*) steady fixation, associated with

(i) definitely contracted field of vision ;
(ii) conditions which are likely to get rapidly worse during school age.

*Doubtful Cases.*—It may be desirable to send doubtful cases to a class for partially sighted children, where they can be kept under observation.

*Periodic Revision.*—The certification of blindness in children should always be regarded as *provisional and subject to revision.* Children in blind schools should be periodically examined by an ophthalmic surgeon, and their status determined at each examination. The vision of some children who are properly in blind schools in early years improves materially with age."

Page 104.

**Ophthalmic Standards for defining Partially-Sighted Children.**

One of the first difficulties which confronted the Committee was to define a " partially sighted " child. They have attempted to solve this problem by formulating ophthalmic standards for deciding which children, on account of eye conditions which may be aggravated by following the ordinary school curriculum or extremely defective sight not amounting to " blindness," are in need of special educational provision.

As regards myopes the Committee emphasise that—

" no hard and fast rules can be laid down, but it is desirable to formulate general principles in order to reduce divergencies in practice. These principles are:—

I. If the eyes show fundus changes indicative of a serious condition of myopia the child should always be admitted to a special school.

II. In the absence of signs of such fundus changes the child should usually be admitted to a special school if—

(*a*) after repeated examinations it is found that the myopia has been increasing steadily at the rate of more than 1 dioptre per annum ;

(*b*) after a period of slow rate of increase or apparent arrest it is found that there is a sudden rise in the rate of progress to more than 1 dioptre per annum.

III. The actual amount of myopia should not be the sole factor in determining whether a child should be sent to a special school.

IV. The age of the child must be taken into account. The younger the child the more serious are factors such as degree of myopia present and the rate of progress of that myopia. In doubtful cases the existence of a history of myopia in the family may be a deciding factor.

V. Children with a visual acuity after correction of 6/24 or worse should be admitted to a special school, though the majority of these will probably fall within category I. above.

For non-myopes the standard of selection recommended is:—

Children with a visual acuity after correction of 6/24 or worse should be admitted to a special school."

# APPENDIX IV.

## Headings under which the Result of the Secretary's Investigation has been Analysed.

**Ante-natal examination as a preventive measure and V.D. treatment.**

1. Is ante-natal examination provided for through Clinics?
2. Is there provision for V.D. treatment at Centre, Clinic or Hospital if ante-natal examination indicates the need?

**Infancy : Preventive measures relating to children under 1 year of age.**

3. Are arrangements made to ensure prompt treatment for cases of Ophthalmia Neonatorum?
4. Is Home Nursing of Ophthalmia Neonatorum cases provided or otherwise arranged for?
5. Is Hospital accommodation available for Ophthalmia Neonatorum cases, for child and mother?
6. Is there routine use by midwives of a prophlyactic such as silver nitrate, etc.?

**Pre-school children (1 to 5 years of age).**

7. Are there Maternity and Child Welfare Centres established in the area?
8. Are there any Toddlers' Clinics or Nursery Schools?
9. Is any examination for defective vision undertaken at the Maternity and Child Welfare Centres?
10. Are obvious eye defects referred from Centre or Health Visitor to: (*a*) Eye Hospital, (*b*) School Clinic, (*c*) private specialist?
11. Are cases of squint referred promptly for examination and treatment?
12. Is there systematic visitation by Health Visitors of children between 1 and 5 years?

**School age (5 to 14 years of age).**

13. Is vision testing carried out before 8 years of age (Routine Intermediate Examination) (*a*) as " specials," (*b*) other methods?
14. Are pre-school record cards (or summary) passed on to School Medical Authority from Maternity and Child Welfare Centre or from Health Visitor's record?
15. Are children referred for treatment at medical inspection followed up by school nurses, school attendance officers and, if necessary, by an officer of the N.S.P.C.C.?

16. Is there general evidence that parents are averse to their children being tested for eye defects and being ordered glasses?

17. Is the lighting (day and artificial) in the schools reported on by the School Medical Officer and defects reported to the Local Education Authority?

18. Is there evidence of a need for more residential provision for cases of Phlyctenular Keratitis?

**Post-school and adult life.**

19. Is there an approved Scheme under Section 66 of the Public Health Act, 1925 (assistance towards prevention of blindness), in force in the area?

20. If not, does the Public Health Department give assistance, by grants or otherwise, if applied to, for provision of spectacles, travelling facilities or cost of operation?

21. Does the Local Authority assist the local Blind Society to carry out preventive work by a grant in aid?

22. Does the Local Blind Society give assistance in prevention of blindness through voluntary funds?

23. Does the Public Health Department carry out any propaganda relating definitely to prevention of blindness?

# APPENDIX V.

## Statistics relating to Ophthalmia Neonatorum, to be studied in connection with Appendix VI.

THERE appears to be little doubt that blindness due to Ophthalmia Neonatorum has become less during the twentieth century, but statistical proof of a decrease in the incidence of the disease is not easy to obtain.

The following Table, compiled from figures extracted from the Annual Reports of the Registrar-General, shows the incidence of Ophthalmia Neonatorum in England and Wales over a period of eighteen years, as revealed by notification of the disease. The figures show a gradually falling case-rate of Ophthalmia Neonatorum per 1,000 births throughout England and Wales as a whole, but the inference to be drawn cannot be accepted without reservation.

TABLE I.

| Year | Total Births | Total notifications of O.N. | Case Rate per 1,000 Births |
|---|---|---|---|
| 1914 ... ... | 879,096 | 6,166 | (39 weeks) |
| 1915 ... ... | 814,614 | 6,806 | 8·34 |
| 1916 ... ... | 785,520 | 7,613 | 9·69 |
| 1917 ... ... | 668,346 | 6,716 | 10·05 |
| 1918 ... ... | 662,661 | 6,532 | 9·85 |
| 1919 ... ... | 692,438 | 8,648 | 12·49 |
| 1920 ... ... | 957,782 | 10,294 | 10·74 |
| 1921 ... ... | 848,814 | 8,312 | 9·79 |
| 1922 ... ... | 780,124 | 7,106 | 9·11 |
| 1923 ... ... | 758,131 | 6,592 | 8·70 |
| 1924 ... .. | 729,933 | 6,267 | 8·59 |
| 1925 ... ... | 710,582 | 5,748 | 8·09 |
| 1926 ... ... | 694,563 | 5,896 | 8·49 |
| 1927 ... ... | 654,172 | 5,891 | 9·01 |
| 1928 ... ... | 660,267 | 5,609 | 8·50 |
| 1929 ... ... | 643,673 | 5,448 | 8·46 |
| 1930 ... ... | 648,811 | 5,481 | 8·45 |
| 1931 ... ... | 632,081 | 5,158 | 8·16 |
| 1932 ... ... | 613,972 | 4,730 | 7·70 |
| 1933 ... ... | 580,413 | 3,855 | 6·64 |

Variations in the standard of notification of Ophthalmia Neonatorum have to be taken into account when assessing the value of these statistical returns, because, as the Departmental Committee pointed out in paragraph 36 of their Report of 1922, " notification was not adopted for the purpose of compiling returns, but primarily to enable cases to be brought immediately under the purview of the Maternity and Child Welfare Department of the Sanitary Authority concerned with a view to securing prompt and effective treatment."

It has recently been ascertained that one or two County Borough Councils have, since 1926, been including in their returns not only cases notified by medical practitioners as cases of Ophthalmia Neonatorum (which is defined in the Regulations issued by the Minister of Health in 1926 as "a purulent discharge from the eyes of an infant commencing within 21 days of the date of its birth"), but also all cases of inflammation of the eyes reported by midwives and Health Visitors whether they turn out to be cases of Ophthalmia Neonatorum or not.

Two authorities are known to have been following this practice in their official returns, and the statistics for the country are impaired to the extent of the discrepancy between the true and the inflated figure. We are informed, however, that there is a wide divergence of opinion among doctors as to what constitutes a "notifiable" case of Ophthalmia Neonatorum, since a "purulent discharge" may vary from a slight infective condition to one of virulence. It has been pointed out that the prime object of notification is to secure prompt and effective treatment, and one Local Authority with a high case incidence of Ophthalmia Neonatorum accepts notification of conditions which are only just within the definition rather than risk missing a potential case of blindness.

Notification figures, therefore, cannot be relied upon to give a true picture of the facts regarding the incidence of the disease.

Our more vital concern, however, is with such evidence as we can find of a decrease of *blindness* due to Ophthalmia Neonatorum, but it is by no means a simple task to find figures of a comparable nature.

Table IV. of Appendix VI. (in which the returns from 77 County Boroughs are analysed for the periods 1927-29 and 1930-32) will repay study in conjunction with the explanatory notes. The number of cases of total blindness from Ophthalmia Neonatorum which have occurred in these County Boroughs during the six years reviewed in this Table is encouragingly small, and the Fifteenth Annual Report of the Ministry of Health in 1933 gives the number of cases of Ophthalmia Neonatorum resulting in loss of vision in England (not including Wales) as six. The figure for "impaired vision" in 1933 is 47. Table IV. of Appendix VI. shows considerable variation in the category of "impaired vision." We understand that in general only those cases are included in this category which show obvious scarring of the cornea at the time of making the returns (within twelve months after birth), but we have no means of assessing the possible extent of the damage to sight which may escape detection until the child reaches school age and becomes subject to periodical medical examination.

We are indebted to a member of the Committee in co-operation with the National Institute for the Blind for the following Table II. The analysis is based on the case forms of children who are or have been resident in the Sunshine Homes for Blind Babies, and none of the groups contains any of the same children. At the same time no group contains all the children under five who were on the register of the blind in the last year of each age period, but represents rather less than half that number. This Table II. is, however, the best evidence we have so far been able to obtain of a decrease in the percentage of blindness due to Ophthalmia Neonatorum, as shown between the first and third groups. We are aware, however, that the significance of these figures

might be modified or even contradicted if it were possible to secure an analysis of the residue of cases (*cf.* Table III. below):—

TABLE II.

| Number of Cases of Blind Children | Born within the Years: | Percentage blind from O.N. |
|---|---|---|
| 103 | 1919-1923 | 40·7 |
| 124 | 1924-1928 | 30·6 |
| 130 | 1929-1933 | 27· |

The following statistics of the registration of blind persons in England and Wales (*a*) under the age of 5 years and (*b*) between the ages of 5 and 16 appear in various Reports of the Advisory Committee on the Welfare of the Blind and for 1934 in the Report of the Union of Counties Associations for the Blind and of the South Wales and Monmouthshire Counties Association for the Blind:—

TABLE III.

| | Under 5 | 5—16 | Total of all ages |
|---|---|---|---|
| 1st January, 1919 ... ... | 219 | 2,098 | 25,840 |
| 1st April, 1920 ... ... ... | 248 | 2,366 | 30,708 |
| 1st April, 1921 ... ... ... | 302 | 2,563 | 34,894 |
| 30th June, 1923 ... ... | 231 | 2,723 | 36,518 |
| 31st March, 1925 ... ... | 257 | 2,720 | 42,140 |
| 31st March, 1927 ... ... | 258 | 2,554 | 46,822 |
| 31st March, 1929 ... ... | 258 | 2,438 | 52,727 |
| 31st March, 1932 ... ... | 225 | 2,066 | 62,079 |
| 31st March, 1934 ... ... | 231 | 2,026 | 64,842 |

The significance of Table III. is vitiated to some extent by the undoubted improvement in the registration of blind persons, including children. It must also be remembered that the numbers given in the age groups are cumulative and that a proportion of those included in the total of each age group will be repeated for the number of years comprised in the group.

It would be possible to make out a case for a reduction in blindness among children under 5 if we assumed the decrease in the percentage of blind children to the total blind population to be a true index of fact. This is not possible, however, as any percentage decrease shown as between 1923 and 1934, for example, would not be due to a decrease in the number of children under 5 but to an increase in the numbers of blind persons of 5 years and upwards.

The following Table IV. gives a fairer indication of the position. We have taken the average number of children under 5 registered as blind

in 1920 and 1921 and in 1930 and 1931 in order to rule out chance fluctuations due to some unforeseen factor, and have compared these figures with the total population under 5 years of age in 1921 and 1931. The result is given below:—

TABLE IV.

| Years | Average number of Blind Children under 5 | Total Population under 5 years of age | Blindness incidence rate per million |
|---|---|---|---|
| 1920 } 1921 } ... ... | 302 | 3,321,703 | 83 |
| 1930 } 1931 } ... ... | 267 | 2,990,297 | 85 |

This Table reveals a position which is practically stationary, and we have here no statistical evidence of a decrease in blindness among children under 5. Even taking into account the improvement in registration it is improbable that it would materially affect the situation, although it might bring the case incidence level instead of showing a higher figure for 1931.

We are unable to say what proportion of the children under 5 are blind from Ophthalmia Neonatorum, but the evidence of Table II. points to about one-third as a reasonable proportion. We are strongly of opinion that, so long as any cases occur in this country, every effort should be made to render effective the machinery which exists for eradicating, so far as is humanly possible, blindness from this preventable cause.

# APPENDIX VI.

## Ophthalmia Neonatorum: Statistician's Notes.

TABLE I. gives the annual case rates of notified cases of Ophthalmia Neonatorum for the period 1922-1932. In 1927 the case rate was 9·01 per 1,000 births. Since then it has decreased annually, and the incidence in 1932 was as much as 6 per cent. below the incidence in 1931. To avoid chance fluctuations in the annual rates the data were grouped into two triennial periods, 1927-29 and 1930-1932. When the incidence in the latter was expressed as a percentage of that in the former it was found that there was a decrease of 6·4 per cent., which is " statistically significant " and unlikely to be due to mere chance.

## TABLE I.

COMPILED FROM FIGURES EXTRACTED FROM THE ANNUAL REPORTS OF THE REGISTRAR GENERAL.

**Showing the incidence of Ophthalmia Neonatorum in England and Wales. Civilians (excluding cases in Port Sanitary Districts).**

| Year | Total Births | Total notified Cases of O.N. | Case rate per 1,000 Births |
|---|---|---|---|
| 1922 | 780,124 | 7,106 | 9·11 |
| 1923 | 758,131 | 6,592 | 8·70 |
| 1924 | 729,933 | 6,267 | 8·59 |
| 1925 | 710,582 | 5,748 | 8·09 |
| 1926 | 694,563 | 5,896 | 8·49 |
| 1927 | 654,172 | 5,891 | 9·01 |
| 1928 | 660,267 | 5,609 | 8·50 |
| 1929 | 643,673 | 5,448 | 8·46 |
| 1930 | 648,811 | 5,481 | 8·45 |
| 1931 | 632,081 | 5,158 | 8·16 |
| 1932 | 613,972 | 4,730 | 7·70 |
| 1927-1929 | 1,958,112 | 16,948 | 8·66 |
| 1930-1932 | 1,894,864 | 15,369 | 8·11 |

The incidence in 1930-32 as compared with that in 1927-29 declined 6·4 per cent.

Table II. shows considerable variation in the case rates in the individual County Boroughs during each triennium examined. During the period 1927-1929 there were 49 County Boroughs with an incidence rate of less than 9 cases per 1,000 births, and 4 County Boroughs—Birmingham, Liverpool, Wolverhampton and Stoke—with a case rate which exceeded 27 per 1,000 births. It will be observed that there is little or no alteration in the later triennium in which the case rates are still very high. Some reasons for the differences in the incidence of Ophthalmia Neonatorum between different County Boroughs are given in the foregoing Appendix V.

## TABLE II.

**Showing the County Boroughs classified according to incidence of Ophthalmia Neonatorum.**

| Case rate per 1,000 Births. | 1927—1929 Frequency | 1930—1932 Frequency. |
|---|---|---|
| 0— | 4 | 4 |
| 3— | 16 | 29 |
| 6— | 29 | 21 |
| 9— | 16 | 19 |
| 12— | 11 | 2 |
| 15— | 3 | 3 |
| 18— | | 1 Oxford |
| 21— | | 1 Stoke |
| 24— | | |
| 27— | 1 Birmingham | 1 Wolverhampton |
| 30— | 2 Liverpool<br>Wolverhampton | 1 Birmingham |
| 33— | 1 Stoke | 1 Liverpool |
| Total ... | 83 | 83 |

We saw in Table I. that the incidence of notification of Ophthalmia Neonatorum declined to the extent of 6·4 per cent. in England and Wales during 1930-1932 as compared with 1927-1929. The contrasted experience in the individual County Boroughs for the two triennial periods is detailed in Table III.A, and more concisely presented in Table III.B.

## TABLE III.A.

**Showing the incidence of Ophthalmia Neonatorum in each County Borough, and also the incidence in 1930-1932 expressed as a Percentage of that in 1927-29.**

| County Borough | A 1927—1929 | B 1930—1932 | $\frac{B}{A}$ Per cent. Increase or Decrease |
|---|---|---|---|
| | Per cent. | Per cent. | Per cent. |
| Barnsley ... ... ... ... | 6·91 | 11·69 | 69 |
| Barrow ... ... ... ... | 6·04 | 5·41 | −10 |
| Bath ... ... ... ... ... | 8·90 | 10·77 | 21 |
| Birkenhead ... ... ... ... | 8·45 | 7·35 | −13 |
| Birmingham ... ... ... | 28·27 | 30·07 | 6 |
| Blackburn ... ... ... ... | 98·3 | 8·55 | −13 |
| Blackpool ... ... ... ... | 11·66 | 5·42 | −53 |
| Bolton ... ... ... ... | 6·17 | 8·44 | 37 |
| Bootle ... ... ... ... | 10·53 | 6·89 | −35 |
| Bournemouth ... ... ... | 4·04 | 3·67 | − 9 |
| Bradford ... ... ... ... | 8·86 | 6·25 | −29 |
| Brighton ... ... ... ... | 7·80 | 15·68 | 101 |
| Bristol ... ... ... ... | 5·38 | 4·44 | −17 |
| Burnley ... ... ... ... | 5·45 | 12·62 | 132 |
| Burton-on-Trent ... ... ... | 17·60 | 15·89 | −10 |
| Bury ... ... ... ... ... | 12·67 | 10·78 | −15 |
| Canterbury ... ... ... ... | 6·23 | 5·68 | − 9 |
| Carlisle ... ... ... ... | 10·07 | 11·19 | 11 |
| Chester ... ... ... ... | 9·05 | 6·92 | −24 |
| Coventry ... ... ... ... | 7·50 | 5·14 | −31 |
| Croydon ... ... ... ... | 3·02 | 5·28 | 75 |

| County Borough | A 1927—1929 | B 1930—1932 | B/A Per cent. increase or decrease |
|---|---|---|---|
| | Per cent. | Per cent. | Per cent. |
| Darlington ... ... ... ... | 10·59 | 6·06 | −43 |
| Derby ... ... ... ... | 6·65 | 16·35 | 146 |
| Dewsbury ... ... ... ... | 9·53 | 11·23 | 18 |
| Doncaster ... ... ... ... | 7·05 | 6·64 | − 6 |
| Dudley ... ... ... ... | 4·38 | 5·04 | 15 |
| Eastbourne ... ... ... ... | 2·96 | 1·49 | −50 |
| East Ham ... ... ... ... | 3·73 | 3·14 | −16 |
| Exeter ... ... ... ... | 9·37 | 7·43 | −21 |
| Gateshead ... ... ... ... | 5·75 | 4·95 | −14 |
| Gloucester ... ... ... ... | 13·03 | 11·49 | −12 |
| Great Yarmouth ... ... ... | 2·98 | 1·59 | −67 |
| Grimsby ... ... ... ... | 6·76 | 6·93 | 3 |
| Halifax ... ... ... ... | 7·14 | 4·82 | −32 |
| Hastings ... ... ... ... | 8·30 | 8·76 | 6 |
| Huddersfield ... ... ... | 15·33 | 12·22 | −20 |
| Ipswich ... ... ... ... | 5·36 | 9·72 | 81 |
| Kingston-on-Hull ... ... ... | 7·49 | 5·10 | −32 |
| Leeds ... ... ... ... | 8·30 | 6·79 | −18 |
| Leicester ... ... ... ... | 8·21 | 6·01 | −27 |
| Lincoln ... ... ... ... | 6·34 | 8·62 | 36 |
| Liverpool ... ... ... ... | 30·95 | 35·86 | 16 |
| Manchester ... ... ... ... | 13·36 | 10·02 | −25 |
| Middlesbrough ... ... ... | 6·23 | 3·40 | −45 |
| Newcastle-on-Tyne ... ... | 12·48 | 11·91 | − 5 |
| Northampton ... ... ... | 7·82 | 7·84 | 0 |
| Norwich ... ... ... ... | 9·43 | 9·32 | − 1 |
| Nottingham ... ... ... | 7·56 | 6·02 | −20 |
| Oldham ... ... ... ... | 9·33 | 8·01 | −14 |
| Oxford ... ... ... ... | 12·59 | 20·92 | 66 |
| Plymouth ... ... ... ... | 8·28 | 10·79 | 30 |
| Portsmouth ... ... ... ... | 5·97 | 4·81 | −19 |
| Preston ... ... ... ... | 5·37 | 3·74 | −30 |
| Reading ... ... ... ... | 7·06 | 6·55 | − 7 |
| Rochdale ... ... ... ... | 7·60 | 4·53 | −40 |
| Rotherham ... ... ... ... | 4·39 | 3·63 | −17 |
| St. Helens ... ... ... ... | 9·54 | 3·59 | −62 |
| Salford ... ... ... ... | 10·80 | 5·84 | −46 |
| Sheffield ... ... ... ... | 12·15 | 5·57 | −54 |
| Smethwick ... ... ... ... | 10·14 | 11·70 | 15 |
| Southampton ... ... ... | 12·90 | 11·34 | −12 |
| Southend-on-Sea ... ... ... | 16·37 | 10·93 | −33 |
| Southport ... ... ... ... | 7·22 | 5·77 | −20 |
| South Shields ... ... ... | 6·60 | 3·90 | −41 |
| Stockport ... ... ... ... | 14·75 | 8·85 | −40 |
| Stoke-on-Trent ... ... ... | 33·59 | 22·81 | −32 |
| Sunderland ... ... ... ... | 13·74 | 10·40 | −24 |
| Tynemouth ... ... ... ... | 12·58 | 11·72 | − 7 |
| Wakefield ... ... ... ... | 11·85 | 7·25 | −39 |
| Wallasey ... ... ... ... | 3·19 | 5·41 | 70 |
| Walsall ... ... ... ... | 9·94 | 11·15 | 12 |
| Warrington ... ... ... ... | 4·72 | 2·94 | −38 |
| West Bromwich ... ... ... | 2·00 | 4·91 | 146 |
| West Ham ... ... ... ... | 4·87 | 4·29 | −12 |
| West Hartlepool ... ... ... | 11·35 | 8·94 | −21 |
| Wigan ... ... ... ... | 4·93 | 3·83 | −22 |
| Wolverhampton ... ... ... | 31·17 | 28·79 | − 8 |
| Worcester ... ... ... ... | 7·73 | 10·66 | 38 |
| Yorks ... ... ... ... | 6·08 | 5·37 | −12 |
| WALES. | | | |
| Cardiff ... ... ... ... | 14·95 | 11·03 | −26 |
| Merthyr Tydfil ... ... ... | 2·99 | 5·95 | 99 |
| Newport ... ... ... ... | 5·44 | 2·09 | −62 |
| Swansea ... ... ... ... | 7·06 | 5·58 | −21 |

## TABLE III.B.

**Showing the Percentage Increase or Decrease in the incidence of Ophthalmia Neonatorum in the County Boroughs in 1930-32 as compared with 1927-29.**

| Per cent. | | Number of County Boroughs. |
|---|---|---|
| 80 – | Decrease | 3 |
| 60 – | | 7 |
| 40 – | | 21 |
| 20 – | | 27 |
| 0 | Increase | 10 |
| 20 – | | 5 |
| 40 – | | — |
| 60 – | | 4 |
| 80 – | | 2 |
| 100 – | | 1 |
| 120 – | | 1 |
| 140 – | | 2 |
| Total ... | | 83 |

Taking this Table III.B as a basis of discussion, we find that 58 out of the 83 County Boroughs showed a decreased incidence in 1930-1932 as compared with 1927-29. In 3 towns the decline was between 60 per cent. and 80 per cent. and in 21 it was between 20 and 40 per cent. On the other hand, there were 25 towns which showed an increased prevalence, and in 4 of these the increase was to the extent of 100 per cent. or more. These were:—

| Towns | 1927–1929 | | 1930–1932 | |
|---|---|---|---|---|
| | Case rate | Number of cases | Case rate | Number of cases |
| Brighton ... ... ... | 7·80 | 46 | 15·68 | 91 |
| Burnley ... ... ... | 5·45 | 24 | 12·62 | 48 |
| Derby ... ... ... | 6·65 | 47 | 16·35 | 111 |
| West Bromwich ... | 2·00 | 10 | 4·91 | 24 |

The numbers on which the case rates are based are small in West Bromwich and Burnley, but in Brighton and Derby are much more important. The increase may be a real one or may be due to variations in the standard of notification. (*See* Appendix V., page 108.)

Table IV. is an analysis of the results of treatment of Ophthalmia Neonatorum, but in analysing the statistics it was impossible, owing to imperfections in the data, to include all the County Boroughs. Six were rejected owing to defects. The results for each of the remaining 77 towns are given in full. Although this Table IV. is important in the sense that it reveals the complete experience of each County Borough as regards the place of treatment and the results, nevertheless due care

must be exercised in drawing conclusions from the data. The statistics are affected by two considerations—(1) paucity of numbers, (2) variation in the standard of notification. The latter has been previously mentioned, and attention will now be drawn to the former. It will be clear that the smaller the number in a sample (number of notifications of Ophthalmia Neonatorum in a town) the more likely will the result (percentage with impaired or unimpaired vision) be influenced by fluctuations of random sampling. For instance, a proportion of 10 per cent. with impaired vision based on 20 notifications represents only 2 cases of defective vision and is not nearly so reliable an estimate as a similar percentage based on 1,000 notified cases. We can, however, test the significance of the various percentages because the importance of each one will vary inversely as the square root of the number of notified cases on which the percentage is calculated. As a guide to the reliability of the percentages in the Table the following information will be helpful:—

| Number of Observations | 1927–29 Standard Error. | 1930–32 Standard Error. |
|---|---|---|
| 0– 50 | 2·59 | 2·26 |
| 50– 100 | 1·50 | 1·31 |
| 100– 200 | 1·06 | ·92 |
| 200– 400 | ·75 | ·65 |
| 400– 600 | ·58 | ·51 |
| 600–1,000 | ·46 | ·40 |
| 1,000–2,000 | ·33 | ·29 |

It can be interpreted as follows:—

In a town having under 50 notifications of Ophthalmia Neonatorum during the period 1927-29 one would expect to find that the percentage with defective vision was 1·71 (the proportion for all County Boroughs), but allowing for the smallness of the sample, under 50 cases, the percentage might by mere chance be as much as 1·71 plus 2·59 or as low as 1·71 minus 2·59 ; but the odds are 20 to 1 against the percentage being by chance as much as 1·71 plus or minus *twice* 2·59. When judged by this criterion the results in many of the towns become unimportant, but there are towns in which for one or other of the triennia the incidence of defective vision is somewhat greater than one would expect.

As regards the proportion of cases treated at home and in hospital the practices vary considerably in different towns. Birmingham, for example, sends over 90 per cent. of its cases to hospital. Liverpool keeps them at home. The data in Table IV. are shown more concisely in Table V.

In this Table we find that there were 8,091 cases of Ophthalmia Neonatorum notified in the 77 County Boroughs during the period 1927-1929, and 7,434 in 1930-1932. In the first triennium 64·02 per cent. were treated at home and 35·98 per cent. in hospital as compared with 60·56 per cent. and 39·44 per cent. in the latter period. There is thus a very slight tendency for more cases to be treated in hospital.

must be exercised in drawing conclusions from the data. The statistics are affected by two considerations—(1) paucity of numbers, (2) variation in the standard of notification. The latter has been previously mentioned, and attention will now be drawn to the former. It will be clear that the smaller the number in a sample (number of notifications of Ophthalmia Neonatorum in a town) the more likely will the result (percentage with impaired or unimpaired vision) be influenced by fluctuations of random sampling. For instance, a proportion of 10 per cent. with impaired vision based on 20 notifications represents only 2 cases of defective vision and is not nearly so reliable an estimate as a similar percentage based on 1,000 notified cases. We can, however, test the significance of the various percentages because the importance of each one will vary inversely as the square root of the number of notified cases on which the percentage is calculated. As a guide to the reliability of the percentages in the Table the following information will be helpful:—

| Number of Observations | 1927–29 Standard Error. | 1930–32 Standard Error. |
|---|---|---|
| 0– 50 | 2·59 | 2·26 |
| 50– 100 | 1·50 | 1·31 |
| 100– 200 | 1·06 | ·92 |
| 200– 400 | ·75 | ·65 |
| 400 - 600 | ·58 | ·51 |
| 600–1,000 | ·46 | ·40 |
| 1,000–2,000 | ·33 | ·29 |

It can be interpreted as follows:—

In a town having under 50 notifications of Ophthalmia Neonatorum during the period 1927-29 one would expect to find that the percentage with defective vision was 1·71 (the proportion for all County Boroughs), but allowing for the smallness of the sample, under 50 cases, the percentage might by mere chance be as much as 1·71 plus 2·59 or as low as 1·71 minus 2·59 ; but the odds are 20 to 1 against the percentage being by chance as much as 1·71 plus or minus *twice* 2·59. When judged by this criterion the results in many of the towns become unimportant, but there are towns in which for one or other of the triennia the incidence of defective vision is somewhat greater than one would expect.

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# TABLE IV.

## Ophthalmia Neonatorum.

**Showing the results of treatment in each County Borough.**

**A.—1927-1929.** **B.—1930-1932.**

| County Boroughs (77) | A. Cases notified | A. Treated at home | A. Treated at hospital | A. Vision unimpaired | A. Vision impaired | A. Total blindness | A. Deaths and left city | B. Cases notified | B. Treated at home | B. Treated at hospital | B. Vision unimpaired | B. Vision impaired | B. Total Blindness | B. Deaths and left city |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Per cent. | Per cent. | Per cent. | Per cent. | Per cent. | Per cent. | | Per cent. | Per cent. | Per cent. | Per cent. | Per cent. | Per cent. |
| Barnsley | 32 | 96·9 | 3·1 | 96·9 | — | — | 3·1 | 50 | 82·0 | 18·0 | 100·0 | — | — | — |
| Barrow-in-Furness | 20 | 85·0 | 15·0 | 100·0 | — | — | — | 16 | 100·0 | — | 100·0 | — | — | — |
| Bath | 22 | 36·4 | 63·6 | 100·0 | — | — | — | 26 | 23·1 | 76·9 | 96·2 | 3·8 | — | — |
| Birkenhead | 74 | 79·7 | 20·3 | 100·0 | — | — | — | 60 | 83·3 | 16·7 | 100·0 | — | — | — |
| Birmingham | 1,461 | 8·5 | 91·5 | 98·2 | 1·4 | .4 | — | 1,532 | 3·5 | 96·5 | 99·1 | ·8 | ·1 | — |
| Blackburn | 49 | 77·6 | 22·4 | 85·7 | 4·1 | 6·1 | 4·1 | 40 | 47·5 | 52·5 | 100·0 | — | — | — |
| Blackpool | 38 | 50·0 | 50·0 | 94·7 | — | — | 5·3 | 17 | 29·4 | 70·6 | 82·4 | 5·9 | — | 11·8 |
| Bolton | 49 | 65·3 | 34·7 | 95·9 | 2·0 | — | 2·0 | 62 | 75·8 | 24·2 | 91·9 | 4·8 | — | 3·2 |
| Bootle | 55 | 81·8 | 18·2 | 94·5 | — | — | 5·4 | 36 | 83·3 | 16·7 | 88·9 | 2·8 | — | 8·3 |
| Bournemouth | 13 | 23·1 | 76·9 | 100·0 | — | — | — | 13 | 46·2 | 53·8 | 100·0 | — | — | — |
| Bradford | 116 | 87·1 | 12·9 | 89·7 | 5·2 | — | 5·2 | 78 | 78·2 | 21·8 | 89·7 | 3·8 | 1·3 | 5·1 |
| Brighton | 46 | 76·1 | 23·9 | 97·8 | 2·2 | — | 2·2 | 91 | 71·4 | 28·6 | 95·6 | 4·4 | — | 3·3 |
| Bristol | 101 | 88·1 | 11·9 | 99·0 | — | — | 1·0 | 81 | 85·2 | 14·8 | 98·8 | — | — | 1·2 |
| Burnley | 24 | 75·0 | 25·0 | 95·8 | — | 4·2 | — | 48 | 81·3 | 18·7 | 91·7 | — | 2·1 | 6·2 |
| Burton-on-Trent | 46 | 100·0 | — | 100·0 | — | — | — | 37 | 100·0 | — | 100·0 | — | — | — |
| Bury | 29 | 79·3 | 20·7 | 100·0 | — | — | — | 23 | 52·2 | 47·8 | 100·0 | — | — | — |
| Canterbury | 7 | 57·1 | 42·9 | 100·0 | — | — | — | 6 | 66·7 | 33·3 | 100·0 | — | — | — |
| Carlisle | 31 | 90·3 | 9·7 | 96·8 | 3·2 | — | — | 33 | 100·0 | — | 100·0 | — | — | — |
| Chester | 19 | 57·9 | 42·1 | 100·0 | — | — | — | 14 | 21·4 | 78·6 | 100·0 | — | — | — |
| Coventry | 51 | 92·2 | 7·8 | 88·2 | 5·9 | — | 5·9 | 38 | 65·8 | 34·2 | 84·2 | 10·5 | — | 5·3 |
| Darlington | 37 | 56·8 | 43·2 | 94·6 | 5·4 | — | — | 21 | 66·7 | 33·3 | 95·2 | 4·8 | — | — |
| Derby | 47 | 78·7 | 21·3 | 93·6 | 2·1 | — | 4·2 | 111 | 83·8 | 16·2 | 97·3 | ·9 | 1·8 | ·9 |
| Dewsbury | 24 | 62·5 | 37·5 | 100·0 | — | — | — | 27 | 74·1 | 25·9 | 88·9 | 11·1 | — | — |
| Doncaster | 22 | 90·9 | 9·1 | 86·4 | 4·5 | — | 9·1 | 20 | 65·0 | 35·0 | 90·0 | — | — | 10·0 |
| Dudley | 16 | 43·8 | 56·2 | 100·0 | — | — | — | 18 | 44·4 | 55·6 | 72·2 | 5·6 | — | 22·4 |
| Eastbourne | 6 | — | 100·0 | 83·3 | — | — | 16·7 | 3 | — | 100·0 | 100·0 | — | — | — |
| East Ham | 25 | 48·0 | 52·0 | 100·0 | — | — | — | 20 | 55·0 | 45·0 | 90·0 | 10.0 | — | — |
| Exeter | 27 | 40·7 | 59·3 | 96·3 | — | — | 3·7 | 21 | 52·4 | 47·6 | 100·0 | — | — | — |
| Gateshead | 46 | 67·4 | 32·6 | 97·8 | 2·2 | — | — | 37 | 73·0 | 27·0 | 100·0 | — | — | — |
| Great Yarmouth | 8 | 100·0 | — | 100·0 | — | — | — | 4 | 100·0 | — | 100·0 | — | — | — |
| Halifax | 28 | 39·3 | 60·7 | 89·3 | — | — | 10·7 | 18 | 16·7 | 83·3 | 100·0 | — | — | — |
| Hastings | 19 | 73·7 | 26·3 | 94·7 | — | — | 5·3 | 20 | 40·0 | 60·0 | 75·0 | 5·0 | — | 20·0 |
| Huddersfield | 70 | 100·0 | — | 92·9 | 4·3 | 1·4 | 1·4 | 52 | 94·2 | 5·8 | 100·0 | — | — | — |
| Kingston-on-Hull | 138 | 73·9 | 26·1 | 97·1 | 1·4 | — | 1·4 | 94 | 64·9 | 35·1 | 98·9 | 1·1 | — | — |
| Ipswich | 23 | 34·8 | 65·2 | 87·0 | 4·3 | — | 8·7 | 41 | 56·1 | 43·9 | 82·9 | 4·9 | — | 12·2 |
| Leeds | 190 | 59·5 | 40·5 | 91·6 | 3·7 | — | 4·7 | 148 | 62·8 | 37·2 | 93·2 | 1·4 | — | 5·4 |
| Leicester | 96 | 75·0 | 25·0 | 89·6 | 1·0 | — | 9·4 | 67 | 67·2 | 32·8 | 91·0 | 4·5 | — | 4·5 |
| Lincoln | 19 | 57·9 | 42·1 | 84·2 | 10·5 | — | 5·3 | 24 | 62·5 | 37·5 | 91·7 | 8·3 | — | — |
| Liverpool | 1,765 | 91·4 | 8·6 | 98·6 | ·3 | ·06 | 1·1 | 1,996 | 91·2 | 8·8 | 98·8 | ·05 | — | 1·2 |
| Manchester | 521 | 94·8 | 5·2 | 94·4 | 1·2 | — | 4·4 | 371 | 90·6 | 9·4 | 95·7 | 1·3 | — | 3·0 |
| Middlesbrough | 59 | 81·4 | 18·6 | 96·6 | 3·4 | — | — | 31 | 71·0 | 29·0 | 96·8 | 3·2 | — | — |
| Newcastle-on-Tyne | 199 | 84·9 | 12·6 | 91·0 | 2·5 | ·5 | 6·0 | 181 | 86·7 | 13·3 | 90·1 | 2·8 | — | 7·2 |
| Northampton | 30 | 50·0 | 50·0 | 93·3 | 3·3 | — | 3·3 | 29 | 58·6 | 41·4 | 89·7 | 10·3 | — | — |
| Norwich | 58 | 60·3 | 39·7 | 93·1 | 1·7 | — | 5·2 | 54 | 50·0 | 50·0 | 98·1 | — | — | 1·9 |
| Nottingham | 105 | 99·0 | 1·0 | 98·1 | 1·9 | — | — | 82 | 90·2 | 9·8 | 93·9 | 4·9 | 1·2 | 3·7 |
| Oldham | 50 | 76·0 | 24·0 | 78·0 | 4·0 | — | 18·0 | 45 | 64·4 | 35·6 | 93·3 | 2·2 | — | 4·4 |
| Plymouth | 86 | 68·6 | 31·4 | 91·9 | 5·8 | — | 2·3 | 109 | 77·1 | 22·9 | 97·2 | ·9 | ·9 | ·9 |
| Portsmouth | 78 | 83·3 | 16·7 | 88·5 | 5·1 | — | 6·4 | 61 | 78·7 | 21·3 | 98·4 | 1·6 | — | — |
| Preston | 31 | 61·3 | 38·7 | 90·3 | 6·5 | — | 3·2 | 21 | 57·1 | 42·9 | 90·5 | 9·5 | — | — |
| Reading | 31 | 83·9 | 16·1 | 90·3 | 6·5 | — | 3·2 | 28 | 64·3 | 35·7 | 78·6 | 10·7 | — | 10·7 |
| Rochdale | 29 | 75·9 | 24·1 | 93·1 | — | — | 6·9 | 16 | 68·8 | 31·2 | 93·8 | — | — | 6·3 |
| Rotherham | 18 | 50·0 | 50·0 | 94·4 | 5·6 | — | — | 14 | 42·9 | 57·1 | 92·9 | — | — | 7·1 |
| St. Helens | 67 | 74·6 | 25·4 | 92·5 | — | — | 7·5 | 24 | 83·3 | 16·7 | 95·8 | — | — | 4·2 |
| Salford | 134 | 75·4 | 24·6 | 98·5 | 1·5 | — | — | 64 | 73·4 | 26·6 | 100·0 | — | — | — |
| Sheffield | 300 | 75·7 | 24·3 | 91·7 | 1·0 | — | 7·3 | 126 | 56·3 | 43·7 | 94·4 | — | — | 5·6 |
| Smethwick | 43 | 65·1 | 34·9 | 100·0 | — | — | — | 51 | 66·7 | 33·3 | 100·0 | — | — | — |
| Southampton | 118 | 16·9 | 83·1 | 90·7 | ·85 | — | 8·5 | 105 | 11·4 | 88·6 | 97·1 | — | — | 2·9 |
| Southend-on-Sea | 70 | 35·7 | 64·3 | 97·1 | 1·4 | — | 1·4 | 46 | 87·0 | 13·0 | 100·0 | — | — | — |
| Southport | 20 | 50·0 | 50·0 | 90·0 | 5·0 | — | 5·0 | 15 | 46·7 | 53·3 | 93·3 | — | — | 6·7 |
| South Shields | 48 | 91·7 | 8·3 | 89·6 | 4·2 | — | 6·3 | 27 | 92·6 | 7·4 | 96·3 | — | — | 3·7 |
| Stockport | 79 | 78·5 | 21·5 | 97·5 | 1·3 | — | 1·3 | 45 | 86·7 | 13·3 | 100·0 | — | — | — |
| Sunderland | 164 | 28·0 | 72·0 | 90·9 | 1·9 | ·6 | 6·7 | 128 | 35·9 | 64·1 | 94·5 | 3·1 | — | 2·3 |
| Wakefield | 35 | 51·4 | 48·6 | 88·6 | 11·4 | — | — | 21 | 66·7 | 33·3 | 100·0 | — | — | — |
| Wallasey | 13 | 53·8 | 46·2 | 100·0 | — | — | — | 22 | 100·0 | — | 100·0 | — | — | — |
| Walsall | 61 | 83·6 | 16·4 | 96·7 | 1·6 | 1·6 | — | 68 | 77·9 | 22·1 | 98·5 | — | — | 1·5 |
| Warrington | 22 | 59·1 | 40·9 | 81·8 | 4·5 | — | 13·6 | 13 | 30·8 | 69·2 | 100·0 | — | — | — |
| West Bromwich | 10 | 70·0 | 30·0 | 100·0 | — | — | — | 24 | 70·8 | 29·2 | 87·5 | 4·2 | — | 8·3 |
| West Ham | 86 | 79·1 | 20·9 | 97·7 | 1·2 | 1·2 | — | 68 | 42·6 | 57·4 | 94·1 | 5·9 | — | — |
| West Hartlepool | 50 | 84·0 | 16·0 | 90·0 | 4·0 | 4·0 | 4·0 | 39 | 79·5 | 20·5 | 94·9 | 2·6 | — | 2·6 |
| Wigan | 24 | 100·0 | — | 100·0 | — | — | — | 18 | 94·4 | 5·6 | 100·0 | — | — | — |
| Wolverhampton | 235 | 48·1 | 51·9 | 96·6 | — | — | 3·4 | 199 | 40·2 | 59·8 | 100·0 | — | — | — |
| Worcester | 18 | 55·6 | 44·4 | 94·4 | — | — | 5·6 | 25 | 24·0 | 76·0 | 100·0 | — | — | — |
| York | 28 | 46·4 | 53·6 | 100·0 | — | — | 10·7 | 22 | 45·5 | 54·5 | 100·0 | — | — | 4·5 |
| **Wales.** | | | | | | | | | | | | | | |
| Cardiff | 181 | 61·3 | 38·7 | 87·3 | 1·1 | — | 11·6 | 122 | 61·5 | 38·5 | 89·3 | ·8 | — | 9·8 |
| Merthyr Tydfil | 11 | 100·0 | — | 100·0 | — | — | — | 20 | 85·0 | 15·0 | 85·0 | 5·0 | 5·0 | 5·0 |
| Newport | 28 | 28·6 | 71·4 | 96·4 | — | — | 3·6 | 10 | 20·0 | 80·0 | 90·0 | — | 10·0 | — |
| Swansea | 62 | 12·9 | 87·1 | 96·8 | 3·2 | — | 1·6 | 47 | 6·4 | 93·6 | 100·0 | — | — | — |

## TABLE V.

**Showing the results of treatment in groups of County Boroughs in which the incidence of Ophthalmia either increased (+) or decreased (−) between 1930-32 and 1927-29.**

| County Boroughs | 1927–1929 | | | | | | | 1930 –1932 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Notified cases | Treated | | Vision unimpaired | Vision impaired | Total Blindness | Deaths and left city | Notified cases | Treated | | Vision unimpaired | Vision impaired | Total Blindness | Deaths and left city |
| | | at home | at hospital | | | | | | at home | at hospital | | | | |
| 77 | 8091 | 5180 | 2911 | 7733 | 121 | 17 | 220 | 7434 | 4502 | 2932 | 7205 | 87 | 10 | 132 |
| | | 64·02 | 35·98 | 95·58 | 1·50 | ·21 | 2·72 | | 60·56 | 39·44 | 96·92 | 1·17 | ·13 | 1·78 |
| +21 | 3820 | 2155 | 1665 | 3743 | 39 | 8 | 30 | 4398 | 2505 | 1893 | 4311 | 34 | 7 | 46 |
| | | 56·41 | 43·59 | 97·98 | 1·02 | ·21 | ·79 | | 56·96 | 43·04 | 98·02 | ·77 | ·16 | 1·05 |
| −55 | 4241 | 3010 | 1231 | 3962 | 81 | 9 | 189 | 3007 | 1980 | 1027 | 2868 | 50 | 3 | 86 |
| | | 70·97 | 29·02 | 93·42 | 1·91 | ·21 | 4·46 | | 65·84 | 34·15 | 95·38 | 1·66 | ·10 | 2·86 |
| +−1 | 30 | 15 | 15 | 28 | 1 | — | 1 | 29 | 17 | 12 | 26 | 3 | — | — |
| | | 50·00 | 50·00 | 93·33 | 3·33 | — | 3·33 | | 58·62 | 41·38 | 89·65 | 10·34 | — | — |

The proportion with impaired vision decreased from 1·71 per cent. in 1927-1929 to 1·30 per cent. during 1930-1932, or a decline of 24 per cent. Sub-dividing the county boroughs into those in which (1) the incidence of the disease increased during 1930-1932 as compared with 1927-1929, (2) in which it decreased, (3) in which it remained stationary, the numbers in each category were 21, 55 and 1.

It will be observed that in the County Boroughs which showed a decreased incidence the proportion of home treated cases and likewise the percentage with impaired vision was greater than in those where the incidence of the disease increased. This would appear to suggest that hospital treatment is more effective than that administered in the home, but the experience in both Birmingham and Liverpool (as shown in Table IV.) is at variance with this suggestion. These two cities, as we have already seen, pursue different policies as regards treatment in hospital ; the former sends over 90 per cent. of the cases to hospital, the latter retains them for nursing in the home. In Birmingham the proportion of children with impairment of vision was 1·8 per cent. in 1927-1929 and ·9 per cent. in 1930-1932. The corresponding incidence in Liverpool was ·36 per cent. and ·05 per cent. respectively. The truth is that the present data are not in a suitable form to give a definite answer. Before any conclusion can be reached on the question we should require to know the proportion of visual defects occurring amongst the patients treated at home and the proportion amongst those treated in hospital. The statistics from which the calculations in Tables IV. and V. were made will not permit of this arrangement because the children with defective vision were aggregated irrespective of place of treatment.

Table VI. is an attempt to test the efficacy of prophylactic as compared with non-prophylactic treatment for which the data for 72 County Boroughs were analysed. The results are given in this Table, and although they favour the usage of a prophylaxis, the differences observed are not statistically significant.

There was, however, a wide variation in the type of prophylaxis used in the various towns. Possibly, if the County Boroughs which had adopted prophylactic treatment had adhered rigidly to a fixed standard, there would have been a greater differentiation between the treated and untreated cases than that observed in the present instance.

## TABLE VI.

### A Comparison between Treated and Untreated Cases.

| Number of County Boroughs | 1927—1929 | | | | 1930—1932 | | | |
|---|---|---|---|---|---|---|---|---|
| | Notified | Vision unimpaired | Vision impaired | Total Blindness | Notified | Vision unimpaired | Vision impaired | Total Blindness |
| | | | | Prophylaxis | | | | |
| 39 | 5,763 | 5,544 | 82 | 10 | 5,612 | 5,475 | 55 | 7 |
| | | 96·20 | 1·60 | | | 97·56 | 1·10 | |
| | | | | No Prophylaxis | | | | |
| 33 | 2,026 | 1,911 | 31 | 5 | 1,541 | 1,473 | 22 | 3 |
| | | 94·32 | 1·78 | | | 95·59 | 1·62 | |

# APPENDIX VII.

## List of Eye Hospitals and Hospitals with Ophthalmic Departments, or with Special Facilities for dealing with Eye Cases, arranged in five categories.

### EYE HOSPITALS.

DEVONSHIRE.

| | |
|---|---|
| *Exeter* ... ... | West of England Eye Infirmary. |
| *Plymouth* ... ... | Plymouth Royal Eye Infirmary. |
| *Torquay* ... ... | Torbay Hospital, Provident Dispensary and Eye Infirmary. |

DORSET.

| | |
|---|---|
| *Weymouth* ... ... | Weymouth and Dorset County Royal Eye Infirmary. |

DURHAM.

| | |
|---|---|
| *Sunderland* ... ... | Durham County and Sunderland Eye Infirmary, Stockton Road. |

GLAMORGAN.

| | |
|---|---|
| *Swansea* ... ... | Swansea General and Eye Hospital. |

GLOUCESTERSHIRE.

| | |
|---|---|
| *Bristol* ... ... | Bristol Eye Hospital, Lower Maudlin Street. |
| *Cheltenham* ... ... | Cheltenham General and Eye Hospital. |
| *Gloucester* ... ... | Gloucestershire Royal Infirmary and Eye Institution. |

HAMPSHIRE.

| | |
|---|---|
| *Portsmouth* ... ... | Portsmouth and Southern Counties Eye and Ear Hospital. |
| *Southampton* ... | Free Eye Hospital, Carlton Road. |

HEREFORDSHIRE.

| | |
|---|---|
| *Hereford* ... ... | Victoria Eye Hospital, Eign Street. |

KENT.

| | |
|---|---|
| *Maidstone* ... ... | Kent County Ophthalmic and Aural Hospital. |
| *Tunbridge Wells* ... | Eye and Ear Hospital, Mount Sion. |

LANCASHIRE.

*Liverpool* ... ... St. Paul's Eye Hospital.
*Manchester* ... .. Royal Eye Hospital.

LONDON.

Central London Ophthalmic Hospital, Judd Street, W.C.1.
Royal Eye Hospital, St. George's Circus, S.E.1.
Royal London Ophthalmic Hospital (Moorfields), City Road, E.C.1.
Royal Westminster Ophthalmic Hospital, Broad Street, W.C.2.
Western Ophthalmic Hospital, Marylebone Road, N.W.1.
St. Margaret's Hospital for Ophthalmia Neonatorum, Leighton Road, Kentish Town, N.W.5.

NORTHUMBERLAND.

*Newcastle-on-Tyne*... Newcastle-on-Tyne Eye Hospital.

NOTTINGHAMSHIRE.

*Nottingham* ... ... Nottingham and Midland Eye Infirmary.

OXFORDSHIRE.

*Oxford* ... ... Oxford Eye Hospital, Walton Street.

SALOP.

*Shrewsbury* ... ... Eye, Ear and Throat Hospital for Shropshire and Wales, Murivance.

SOMERSET.

*Bath* ... ... Eye Infirmary, 1 and 2, Belvedere.

STAFFORDSHIRE.

*Wolverhampton* ... Wolverhampton and Midland Counties Eye Hospital.

SUSSEX.

*Brighton* ... ... Sussex Eye Hospital, Queen's Road.
*Eastbourne* ... ... Royal Eye Hospital, Pevensey Road.

WARWICKSHIRE.

*Birmingham* ... Birmingham and Midland Eye Hospital, Church Street.

WORCESTERSHIRE.

*Dudley* ... ... Guest Hospital and Eye Infirmary.

YORKSHIRE.

*Bradford* ... ... Royal Eye and Ear Hospital, Hallfield Road.

[*This list is compiled from returns made by the Voluntary Hospitals at the request of the Central Bureau of Hospital Information (British Hospitals Association) and is not quite complete, nor does it include Hospitals administered by County and County Borough Councils.*]

## CATEGORY A.

**Hospitals with In- and Out-Patient Ophthalmic Departments, having a certain number of beds reserved for Eye cases, and a Resident House Surgeon.**

BERKSHIRE.

| | | |
|---|---|---|
| *Reading* | ... ... | Royal Berkshire Hospital. |
| *Windsor* | ... ... | King Edward VII. Hospital. |

CAERNARVON.

| | | |
|---|---|---|
| *Bangor* | ... ... | Caernarvon and Anglesey Infirmary. |

CAMBRIDGESHIRE.

| | | |
|---|---|---|
| *Cambridge* | ... ... | Addenbrooke's Hospital. |

CARMARTHEN.

| | | |
|---|---|---|
| *Carmarthen* | ... ... | Carmarthen County Hospital. |

CHESHIRE.

| | | |
|---|---|---|
| *Birkenhead* | ... ... | Birkenhead and Wirral Children's Hospital. |
| ,, | ... ... | Birkenhead General Hospital. |
| *Macclesfield* | ... ... | Macclesfield General Hospital. |
| *Stockport* | ... ... | Stockport Infirmary. |
| *Wallasey* | ... ... | Victoria Central Hospital. |

CORNWALL.

| | | |
|---|---|---|
| *Truro* | ... ... | Royal Cornwall Infirmary. |

CUMBERLAND.

| | | |
|---|---|---|
| *Carlisle* | ... ... | Cumberland Infirmary. |

DENBIGH.

| | | |
|---|---|---|
| *Wrexham* | ... ... | Wrexham and East Denbighshire War Memorial Hospital. |

DERBYSHIRE.

| | | |
|---|---|---|
| *Chesterfield* | ... ... | Chesterfield Royal Infirmary. |
| *Derby* | ... ... | Derbyshire Royal Infirmary. |

DEVONSHIRE.

| | | |
|---|---|---|
| *Torquay* | ... ... | Torbay Hospital. |

DORSET.

| | | |
|---|---|---|
| *Poole* | ... ... | Cornelia and East Dorset Hospital. |

DURHAM.

| | |
|---|---|
| *Hartlepool* ... ... | The Hartlepools Hospital. |
| *South Shields* ... | Ingham Infirmary. |
| *Stockton* ... ... | Stockton and Thornaby Hospital. |

ESSEX.

| | |
|---|---|
| *Chelmsford* ... ... | Chelmsford and Essex Hospital. |
| *Colchester* ... ... | Essex County Hospital. |
| *East Ham* ... ... | East Ham Memorial Hospital. |
| *Plaistow* ... ... | St. Mary's Hospital for Women and Children. |
| *Southend* ... ... | Southend-on-Sea General Hospital. |
| *Ilford* ... ... | King George Hospital. |
| *Stratford* ... ... | Queen Mary's Hospital. |
| *Walthamstow* ... | Connaught Hospital. |

GLAMORGAN ... ... Cardiff Royal Infirmary.

GLOUCESTER.

| | |
|---|---|
| *Bristol* ... ... | General Hospital. |
| ,, ... ... | Royal Infirmary. |
| *Cheltenham* ... ... | Cheltenham General and Eye Hospital. |
| *Gloucester* ... ... | The Gloucester Royal Infirmary. |

HAMPSHIRE.

| | |
|---|---|
| *Bournemouth* ... | Royal Victoria and West Hants Hospital. |

KENT.

| | |
|---|---|
| *Canterbury* ... ... | Kent and Canterbury Hospital. |
| *Dover* ... ... | Royal Victoria Hospital. |
| *Folkestone* ... ... | Royal Victoria Hospital. |
| *Gravesend* ... ... | Gravesend and North Kent Hospital. |
| *Maidstone* ... ... | Kent County Ophthalmic and Aural Hospital. |
| *Rochester* ... ... | St. Bartholomew's Hospital. |
| *Tunbridge Wells* ... | Kent and Sussex Hospital. |

LANCASHIRE.

| | |
|---|---|
| *Barrow-in-Furness* ... | North Lonsdale Hospital. |
| *Blackpool* ... ... | Victoria Hospital. |
| *Bolton* ... ... | Bolton Royal Infirmary. |
| *Bootle* ... ... | Bootle General Hospital. |
| *Burnley* ... ... | Victoria Hospital for Burnley and District |
| *Bury* ... ... | Bury Infirmary. |
| *Lancaster* ... ... | Royal Lancaster Infirmary. |
| *Liverpool* ... ... | Liverpool Hahnemann Hospital. |
| ,, ... ... | Liverpool Royal Infirmary. |
| ,, ... ... | Royal Southern Hospital. |
| ,, ... ... | St. Paul's Eye Hospital. |
| *Manchester* ... ... | Manchester Victoria Memorial Jewish Hospital. |

Lancashire—(*cont.*).

| | | |
|---|---|---|
| *Oldham* | ... ... | Oldham Royal Infirmary. |
| *Preston* | ... ... | Preston and County of Lancaster Royal Infirmary. |
| *Rochdale* | ... ... | Rochdale Infirmary. |
| *St. Helen's* | ... ... | Providence Free Hospital. |
| *Southport* | ... ... | Southport Infirmary. |
| *Warrington* | ... ... | Warrington Infirmary and Dispensary. |
| *Wigan* | ... ... | Royal Albert Edward Infirmary and Dispensary. |

LEICESTERSHIRE.

| | | |
|---|---|---|
| *Leicester* | ... ... | Leicester Royal Infirmary. |

LINCOLNSHIRE.

| | | |
|---|---|---|
| *Grimsby* | ... ... | Grimsby and District Hospital. |
| *Lincoln* | ... ... | Lincoln County Hospital. |
| *Scunthorpe* | ... ... | Scunthorpe and District War Memorial Hospital. |

LONDON.

Bermondsey Medical Mission.
Dreadnought Hospital, Greenwich, S.E.10.
Elizabeth Garrett Anderson Hospital, Euston Road, N.W.1.
Evelina Hospital for Sick Children, Southwark, S.E.1.
French Hospital and Dispensary, Shaftesbury Avenue, W.C.2.
Hospital for Sick Children, Great Ormond Street, W.C. 1.
The Infants' Hospital, Vincent Square, S.W.1.
The Italian Hospital, Queen Square, W.C.1.
King's College Hospital, Denmark Hill, S.E.5.
The London Hospital, Whitechapel, E.1.
London Homœpathic Hospital, Great Ormond Street, W.C.1.
London Jewish Hospital, Stepney Green, E.1.
Metropolitan Hospital, Kingsland Road, E.8.
Middlesex Hospital, Mortimer Street, W.1.
Miller General Hospital, Greenwich Road, S.E.10.
Paddington Green Children's Hospital, W.2.
Princess Beatrice Hospital, Finborough Road, S.W.10.
Royal Free Hospital, Gray's Inn Road, W.C.1.
Royal Northern Hospital, Holloway, N.7.
St. Bartholomew's Hospital, Smithfield, E.C.1.
St. George's Hospital, S.W.1.
St. John's Hospital, Morden Hill, Lewisham, S.E.13.
St. Mary's Hospital, Paddington, W.2.
St. Thomas's Hospital, S.E.1.
South-Eastern Hospital for Children, Lewisham, S.E.26.
South London Hospital for Women, Clapham Common, S.W.14.
University College Hospital, Gower Street, W.C.1.
Westminster Hospital, S.W.1.

MIDDLESEX.

| | | |
|---|---|---|
| *Tottenham* | ... ... | Prince of Wales General Hospital. |
| *Willesden* | ... ... | Willesden General Hospital. |

NORFOLK.

| | | |
|---|---|---|
| *Norwich* | ... ... | Norfolk and Norwich Hospital. |

NORTHAMPTON.

| | | |
|---|---|---|
| *Peterborough* | ... | Peterborough and District Memorial Hospital. |

NORTHUMBERLAND.

| | | |
|---|---|---|
| *Newcastle-on-Tyne* | ... | Newcastle-on-Tyne Eye Hospital. |
| ,, ,, | ... | Royal Victoria Infirmary. |

NOTTINGHAMSHIRE.

| | | |
|---|---|---|
| *Nottingham* | ... | Nottingham and Midland Eye Infirmary. |

OXFORD.

| | | |
|---|---|---|
| *Oxford* ... | ... | Oxford Eye Hospital. |

SURREY.

| | | |
|---|---|---|
| *Croydon* ... | ... | Croydon General Hospital. |
| *Guildford* ... | ... | Royal Surrey County Hospital. |
| *Richmond* ... | ... | Royal Hospital. |

STAFFORDSHIRE.

| | | |
|---|---|---|
| *Burslem* ... | ... | Burslem, Haywood and Tunstall War Memorial Hospital. |
| *Burton-on-Trent* | ... | Burton-on-Trent General Infirmary. |
| *West Bromwich* | ... | West Bromwich and District General Hospital. |
| *Wolverhampton* | ... | Wolverhampton and Midland Counties Eye Hospital. |

SUSSEX.

| | | |
|---|---|---|
| *Chichester* ... | ... | Royal West Sussex Hospital. |
| *Hastings* ... | ... | Royal East Sussex Hospital. |
| *Worthing* ... | ... | The Hospital. |

SUFFOLK.

| | | |
|---|---|---|
| *Bury St. Edmund's* | | West Suffolk General Hospital. |
| *Ipswich* ... | ... | East Suffolk and Ipswich Hospital. |
| *Lowestoft* ... | ... | Lowestoft and North Suffolk Hospital. |

WARWICKSHIRE.

| | | |
|---|---|---|
| *Birmingham* | ... | The Queen's Hospital. |
| ,, | ... | The Children's Hospital. |
| *Coventry* ... | ... | The Coventry and Warwickshire Hospital. |
| *Leamington Spa* | ... | Warneford Hospital. |

WILTSHIRE.

| | | |
|---|---|---|
| *Swindon* ... | ... | Swindon and North Wilts Victoria Hospital. |

WORCESTERSHIRE.

| | | |
|---|---|---|
| *Dudley* ... | ... | The Guest Hospital. |
| *Kidderminster* | ... | Kidderminster and District General Hospital. |
| *Stourbridge* ... | ... | The Corbett Hospital. |

YORKSHIRE.

| | |
|---|---|
| *Barnsley* ... ... | The Beckett Hospital. |
| *Dewsbury* ... ... | Dewsbury and District General Infirmary. |
| *Doncaster* ... ... | Doncaster Royal Infirmary and Dispensary. |
| *Harrogate* ... ... | Harrogate and District General Hospital. |
| *Huddersfield* ... | Huddersfield Royal Infirmary. |
| *Hull* ... ... ... | Victoria Hospital for Sick Children. |
| *Keighley* ... ... | Keighley and District Victoria Hospital. |
| *Leeds* ... ... | General Infirmary. |
| ,, ... ... | Leeds Public Dispensary and Hospital. |
| *Middlesbrough* ... | North Ormesby Hospital. |
| *Scarborough* ... | Scarborough Hospital and Dispensary. |
| *Sheffield* ... ... | Sheffield Royal Hospital. |
| ,, ... ... | The Royal Infirmary. |
| ,, ... ... | The Children's Hospital. |
| *Wakefield* ... ... | Clayton Hospital and Wakefield General Dispensary. |

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[*This list is compiled from returns made by the Voluntary Hospitals at the request of the Central Bureau of Hospital Information (British Hospitals Association) and is not quite complete, nor does it include Hospitals administered by County and County Borough Councils.*]

## CATEGORY B.

**Hospitals with In- and Out-Patient Ophthalmic Departments, having a certain number of beds reserved for Eye cases, but no Resident House Surgeon.**

CHANNEL ISLES.

| | |
|---|---|
| *Jersey* ... ... | Jersey Dispensary and Infirmary. |

CHESHIRE.

| | |
|---|---|
| *Ellesmere Port* ... | Ellesmere Port and District Hospital. |

CORNWALL.

| | |
|---|---|
| *Penzance* ... ... | West Cornwall Hospital. |

DEVONSHIRE.

| | |
|---|---|
| *Devonport* ... ... | Prince of Wales Hospital. |

DURHAM.

| | |
|---|---|
| *Durham* ... ... | Durham County Hospital. |

ESSEX.

| | |
|---|---|
| *Brentwood* ... ... | Brentwood District Hospital. |

GLAMORGAN.

| | | |
|---|---|---|
| *Aberdare* | ... ... | Aberdare and District Hospital. |
| *Caerphilly* | ... ... | Caerphilly District Miners' Hospital. |
| *Gorseinon* | ... ... | Gorseinon General Hospital. |

LANCASHIRE.

| | | |
|---|---|---|
| *Ashton-under-Lyne* | ... | District Infirmary. |
| *Colne* | ... ... | The Hartley Hospital. |
| *Liverpool* | ... ... | Liverpool Stanley Hospital. |
| *Ormskirk* | ... ... | Ormskirk General Hospital. |

MONMOUTHSHIRE.

| | | |
|---|---|---|
| *Blaina* | ... ... | Blaina and District Hospital. |
| *Newport* | ... ... | Royal Gwent Hospital. |

NORTHAMPTONSHIRE.

| | | |
|---|---|---|
| *Northampton* | ... | Northampton General Hospital. |

WARWICKSHIRE.

| | | |
|---|---|---|
| *Birmingham* | ... | The General Hospital. |

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## CATEGORY C.

**Hospitals with an Ophthalmic Department with consulting hours on certain days of the week.**

BERKSHIRE.

| | | |
|---|---|---|
| *Maidenhead* | ... ... | Maidenhead Hospital. |

CAERNARVON.

| | | |
|---|---|---|
| *Llandudno* | ... ... | Llandudno and District. |

CARDIGANSHIRE.

| | | |
|---|---|---|
| *Cardigan* | ... ... | Cardigan and District Memorial Hospital. |

CHESHIRE.

| | | |
|---|---|---|
| *Congleton* | ... ... | Congleton War Memorial Hospital. |

CORNWALL.

*Redruth* ... ... West Cornwall Miners' and Women's Hospital.

DEVONSHIRE.

*Newton Abbot* ... Newton Abbot Hospital.
*Paignton* ... ... Paignton and District Hospital.

DORSET.

*Sherborne* ... ... Yeatman Hospital.

DURHAM.

*West Hartlepool* ... Cameron Hospital.

ESSEX.

*Woodford Bridge* ... John Capel Hanbury Hospital.

GLAMORGAN.

*Mountain Ash* ... Mountain Ash and Penrhiwceiber General Hospital.

GLOUCESTERSHIRE.

*Bristol* ... ... Bristol Homœopathic Hospital.
*Stroud* ... ... Stroud General Hospital.

HAMPSHIRE.

*Basingstoke* ... ... Basingstoke Hospital.
*Southampton* ... Royal South Hants and Southampton Hospital.

HERTFORDSHIRE.

*Hitchin* ... ... North Herts and South Beds Hospital.

KENT.

*Deal* ... ... ... Victoria Hospital (Deal, Walmer and District War Memorial) Hospital.
*Tunbridge Wells* ... Tunbridge Wells Homœopathic Hospital.

LANCASHIRE.

*Liverpool* ... ... Waterloo and District General Hospital.
*Manchester* ... ... Manchester Royal Infirmary.
*Nelson* ... ... Reedyford War Memorial Hospital.

LINCOLNSHIRE.

*Grantham* ... ... Grantham Hospital.
*Louth* ... ... Louth and District Hospital.

LONDON.

Princess Louise Kensington Hospital for Children.

MIDDLESEX.

*Acton* ... ... Acton Hospital.
*Ealing* ... ... King Edward Memorial Hospital.
*Hounslow* ... ... Hounslow Hospital.

MONMOUTHSHIRE.

*Blaina* ... ... Blaina and District Hospital.

NORFOLK.

*Great Yarmouth* ... Great Yarmouth General Hospital.

NOTTINGHAMSHIRE.

*Mansfield* ... ... Mansfield and District Hospital.
*Worksop* ... ... Victoria Hospital.

MONTGOMERY.

*Machynlleth* ... Machynlleth Corris and District Hospital.
*Newtown* ... ... Montgomery County Infirmary.
*Welshpool* ... ... Victoria Memorial Hospital.

OXFORDSHIRE.

*Banbury* ... ... Horton General Hospital.

SUSSEX.

*Brighton* ... ... New Sussex Hospital for Women.
*Haywards Heath* ... King Edward VII. Memorial Eliot Hospital.

SURREY.

*Sutton* ... ... The Sutton and Cheam Hospital.
*Woking* ... ... Woking and District Victoria Hospital.

SOMERSET.

*Bath* ... ... ... Royal United Hospital.
*Taunton* ... ... Taunton and Somerset Hospital.

STAFFORDSHIRE.

*Stafford* ... ... Stafford General Infirmary.

WARWICKSHIRE.

*Rugby* ... ... Hospital of St. Cross.

WILTSHIRE.

*Marlborough* ... The Savernake Hospital.

YORKSHIRE.

*Mexborough* ... Mexborough Montagu Hospital.
*Eston* ... ... The Eston Hospital.

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## CATEGORY D.

**Hospitals which can call upon the services of an Ophthalmic Surgeon when required.**

BERKSHIRE.

| | | |
|---|---|---|
| *Maidenhead* | ... | Maidenhead Hospital. |

BUCKINGHAMSHIRE.

| | | |
|---|---|---|
| *Chalfont St. Peter* | ... | Chalfonts and Gerrards Cross Hospital. |
| *High Wycombe* | ... | High Wycombe and District War Memorial Hospital. |

CARDIGANSHIRE.

| | | |
|---|---|---|
| *Cardigan* ... | ... | Cardigan and District Memorial Hospital. |

CHESHIRE.

| | | |
|---|---|---|
| *Alderley Edge* | ... | Alderley Edge Cottage Hospital. |
| *Altrincham* ... | ... | Altrincham General Hospital. |
| *Neston* ... | ... | Neston War Memorial Cottage Hospital. |

DERBYSHIRE.

| | | |
|---|---|---|
| *Bakewell* ... | ... | Bakewell and District War Memorial Cottage Hospital. |

DEVONSHIRE.

| | | |
|---|---|---|
| *Axminster* ... | ... | Axminster Cottage Hospital. |
| *Bovey Tracy* | ... | Bovey Tracey and District Hospital. |
| *Dawlish* ... | ... | Dawlish Cottage Hospital. |
| *Torquay* ... | ... | Rosehill Children's Hospital. |

DORSET.

| | | |
|---|---|---|
| *Sherborne* ... | ... | Yeatman Hospital. |

DURHAM.

| | | |
|---|---|---|
| *Sunderland* ... | ... | Royal Infirmary. |

ESSEX.

| | | |
|---|---|---|
| *Tilbury* ... | ... | Seamen's Hospital. |
| *Woodford* ... | ... | Woodford Jubilee Hospital. |

GLAMORGAN.

| | | |
|---|---|---|
| *Cardiff* ... | ... | Royal Hamadryad Seamen's Hospital. |
| *Gorseinon* ... | ... | Gorseinon General Hospital. |
| *Mountain Ash* | ... | Mountain Ash and Penrhiwceiber General Hospital. |

GLOUCESTERSHIRE.

| | |
|---|---|
| *Bristol* ... ... | Cossham Memorial Hospital. |
| ,, ... ... | Bristol Royal Hospital for Sick Children and Women. |
| *Cirencester* ... ... | Cirencester Memorial Hospital. |
| *Fairford* ... ... | Fairford Cottage Hospital. |
| *Gloucester* ... ... | Gloucester Children's Hospital. |
| *Lydney* ... ... | Lydney and District Hospital. |
| *Tewkesbury* ... ... | Tewkesbury Hospital. |

HAMPSHIRE.

| | |
|---|---|
| *Emsworth* ... ... | Emsworth Victoria Cottage Hospital. |
| *Fleet* ... ... | Fleet and District Hospital. |
| *Gosport* ... ... | Gosport War Memorial Hospital. |

HEREFORDSHIRE.

| | |
|---|---|
| *Hereford* ... ... | Herefordshire General Hospital. |

HERTFORDSHIRE.

| | |
|---|---|
| *Bishop's Stortford* ... | Bishop's Stortford Hospital. |
| *Bushey Heath* ... | Bushey Heath Hospital. |
| *Watford* ... ... | Watford and District Peace Memorial Hospital. |

ISLE OF MAN.

| | |
|---|---|
| *Douglas* ... ... | Noble's Isle of Man Hospital and Dispensary. |
| *Ramsey* ... ... | Ramsey and District Cottage Hospital. |

KENT.

| | |
|---|---|
| *Bromley* ... ... | Bromley (Kent) and District Cottage Hospital. |

LANCASHIRE.

| | |
|---|---|
| *Accrington* ... ... | Victoria Hospital. |
| *Bolton* ... ... | Bolton Royal Infirmary. |
| *Fleetwood* ... ... | Fleetwood Hospital. |
| *Leigh* ... ... | Leigh Infirmary. |
| *Liverpool* ... ... | Royal Liverpool Children's Hospital. |
| ,, ... ... | Waterloo and District General Hospital. |
| *Manchester* ... ... | Manchester Babies' Hospital. |
| ,, ... ... | Royal Manchester Children's Hospital. |
| *Patricroft* ... ... | Eccles and Patricroft Hospital. |
| *Salford* ... ... | Salford Royal Hospital. |
| *Lytham* ... ... | Lytham Hospital. |

LEICESTERSHIRE.

| | |
|---|---|
| *Ashby-de-la-Zouch* ... | Ashby-de-la-Zouch Hospital. |
| *Leicester* ... ... | The John Faire Hospital. |

LINCOLNSHIRE.

| | |
|---|---|
| *Alford* ... ... | Alford and District War Memorial Hospital. |
| *Skegness* ... ... | Skegness and District Cottage Hospital. |

LONDON.

Albert Dock Hospital.
Blackheath and Charlton Hospital, Greenwich, S.E.3.
Catholic Nursing Institute, Lambeth Road, S.E.1.
Cheyne Hospital for Children, Cheyne Walk, S.W.3.
The Children's Hospital, Hampstead, N.W.3.
Florence Nightingale Hospital, Lisson Grove, N.W.1.
Mildmay Memorial Hospital, Newington Green Road, N.1.
Putney Hospital, Lower Common, Wandsworth, S.W.15.
St. Luke's Hostel, 14, Fitzroy Square, W.1.
St. Saviour's Hospital, Osnaburgh Street, N.W.1.

MIDDLESEX.

| | |
|---|---|
| *Hanwell* ... ... | Hanwell Cottage Hospital. |
| *Harrow-on-the-Hill*... | Harrow and Wealdstone Hospital. |
| *Hornsey* ... ... | Hornsey Central Hospital. |
| *Northwood* ... ... | Northwood, Pinner and District Hospital. |
| *Wembley* ... ... | Wembley Hospital. |

MONMOUTHSHIRE.

| | |
|---|---|
| *Blaina* ... ... | Blaina and District Hospital. |
| *Oakdale* ... ... | Oakdale Blackwood Memorial Hospital. |

OXFORDSHIRE.

| | |
|---|---|
| *Henley* ... ... | Henley and District War Memorial Hospital. |
| *Oxford* ... ... | Radcliffe Infirmary. |

SHROPSHIRE.

| | |
|---|---|
| *Shrewsbury* ... ... | Royal Salop Infirmary. |

SURREY.

| | |
|---|---|
| *Carshalton* ... ... | Carshalton, Beddington and Wallington District War Memorial Hospital. |
| *Cobham* ... ... | Cobham and District Cottage Hospital. |
| *Haslemere* ... ... | Haslemere and District Hospital. |
| *Mitcham* ... ... | Wilson Hospital, Mitcham. |
| *Oxted* ... ... | Oxted and Limpsfield Cottage Hospital. |
| *Purley* ... ... | Purley and District War Memorial Hospital. |

SURREY.

| | |
|---|---|
| *Surbiton* ... ... | Surbiton Hospital. |
| *Wimbledon* ... ... | The Nelson Hospital, Kingston Road, S.W. |

SUSSEX.

| | |
|---|---|
| *Bognor* ... ... | Bognor War Memorial Hospital. |
| *Brighton* ... ... | Sussex Maternity and Women's Hospital. |
| ,, ... ... | Royal Sussex County Hospital. |
| *Lewes* ... ... | Victoria Hospital. |

SOMERSET.

| | |
|---|---|
| *Bridgwater* ... ... | Bridgewater Hospital. |

STAFFORDSHIRE.

| | |
|---|---|
| *Barton-under-Needwood* | Barton-under-Needwood Cottage Hospital. |

WESTMORLAND.

| | |
|---|---|
| *Kendal* ... ... | Westmorland County Hospital. |

WILTSHIRE.

| | |
|---|---|
| *Warminster* ... ... | Warminster Hospital. |

WORCESTERSHIRE.

| | |
|---|---|
| *Worcester* ... ... | Worcester Royal Infirmary. |

YORKSHIRE.

| | |
|---|---|
| *Batley* ... ... | Batley and District Hospital. |
| *Bradford* ... ... | Royal Infirmary. |
| *Bridlington* ... ... | Lloyd Hospital. |
| *Castleford* ... ... | Castleford, Normanton and District Hospital. |
| *Denaby Main* ... | Fullerton Hospital. |
| *Driffield* ... ... | Alfred Bean Hospital. |
| *Malton* ... ... | Malton, Norton and District Hospital. |
| *Whitby* ... ... | Whitby and District War Memorial Cottage Hospital. |

# APPENDIX VIII.

## Accidents in Factories and Workshops.

BEFORE considering statistics as to eye injuries it is important to realise exactly what is meant in official returns by the term "accident." In factories and workshops only those accidents which disable the worker for more than three days from earning full wages for the work at which he is employed must be reported to the Home Office and are recorded as accidents. Unless for some special reason enquiry is made, nothing is known of the ultimate result of these reported accidents. An example will show how misleading the returns of eye injuries may be: A simple accident, such as a foreign body in the cornea, may cause incapacity for more than three days if a drop of atropine has been put in the eye after the removal of the foreign body, because a single drop of atropine may cause disturbance of vision lasting seven to eight days.

In coal mines, ironstone mines, metalliferous mines and quarries the employers used to be bound to report to the Mines Department only those accidents which disabled the worker for more than seven days, instead of three days in the case of factories and workshops, and the figures used by the Departmental Committee of 1922 were collected on this basis. Since 1923, however, employers are bound, under the Workmen's Compensation Act, to report accidents involving absence of three days and over as in the case of factories and workshops.

The following Tables A and B give the most important figures with regard to eye accidents which have kept workmen from their work for more than three days. Table A gives figures for 1928, 1932, 1933 and 1934, but Table B deals only with 1933. Table C is an analysis of the figures given in column 7 of Table B.

## TABLE A.—Accidents in Factories and Workshops. (3 days and over.)

| | Year | Total number of persons employed (a) | Total non-fatal accidents reported (3 days and over) (b) | Total number of eye injuries (c) | Percentage of eye injuries to all non-fatal accidents (d) | Ratio of eye injuries to 1,000 persons employed (e) |
|---|---|---|---|---|---|---|
| 1 | 1928 | 5,150,586 | 154,319 | 6,642 | 4·3 | 1·28 |
| 2 | 1932 | 4,680,000 | 106,164 | 4,433 | 4·03 | ·94 |
| 3 | 1933 | 4,704,354 | 112,572 | 4,540 | 4·03 | ·96 |
| 4 | 1934 | Figures not available | 136,073 | 5,950 | 4·37 | — |

*Lines* 1 *and* 2.

The number of persons employed (column (*a*)) are given in Table A, page 48 of the Report of the Chief Inspector of Factories and Workshops, 1933.

The total of non-fatal accidents (column (*b*)) and of eye injuries (column (*c*)) were supplied by the Home Office, Factory Department.

*Line* 4.

The actual number of persons employed is not yet available (column ( *a*)), but is approximately 5,000,000.

The total of non-fatal accidents (column (*b*)) and of total eye injuries (column (*c*)) were extracted from Table 9 (page 103) of the 1933 Report of the Chief Inspector and from Table 9 (page 115) of the 1934 Report.

## TABLE B.—Accidents in Mines and Quarries, 1933. (3 days and over.)

| | —— | Total number of persons employed (f) | Total major and minor injuries (g) | Total number of eye injuries (h) | Percentage of eye to all injuries (j) | Ratio of eye injuries to 1,000 persons employed (k) |
|---|---|---|---|---|---|---|
| 5 | Coal mines including Stratified Ironstone Mines | 797,294 | 122,419 | 5,874 | 4·88 | 7·36 |
| 6 | Mines under Metalliferous Mines Regulation Act | 9,807 | 677 | 23 | 3·39 | 2·34 |
| 7 | Quarries | 65,967 | 4,575 | 295 | 6·44 | 4·32 |
| 8 | Total, 1933 ... | 873,068 | 127,671 | 6,192 | 4·85 | 7·09 |

*Line 5.*

Column (*f*), total number of persons employed, extracted from Tables 16 and 17 (pages 121 and 122) of the Thirteenth Annual Report of the Secretary for Mines, 1933.

*Line 5.*

Columns (*g*) and (*h*) figures for all injuries and eye injuries obtained from Table 54 of the Thirteenth Annual Report of the Secretary for Mines, 1933.

TABLE C.—INCIDENCE OF EYE ACCIDENTS IN QUARRIES, (i.) RAISING IGNEOUS ROCKS, AND (ii.) OTHER QUARRIES, FOR 1933. The total agrees with line 7 in Table B.

| Year | Quarry | Total number of persons employed | Total number of accidents | Total number of eye accidents reported | Percentage of eye injuries to all accidents | Ratio of eye injuries to 1,000 persons employed |
|---|---|---|---|---|---|---|
| 1933 | (i) Igneous Rocks | 14,636 | 1,215 | 131 | 10·78 | 8·9 |
| | (ii) Other Quarries | 51,331 | 3,360 | 164 | 4·88 | 3·2 |
| Total | All Quarries over 20 feet deep | 65,967 | 4,575 | 295 | 6·44 | 4·32 |

# APPENDIX IX.

## Accidents in Mines and Quarries.

TABLES I. (*a*) and (*b*), II., and III. (*a*) and (*b*) below give comparative figures of accidents in mines and quarries for the years 1919, 1920, and 1933.

The figures for 1919 and 1920 are quoted from the 1922 Departmental Committee's Report (paragraphs 231, 234, and 235, pages 93 and 95), but as these were prepared on reported accidents of seven days and over, an approximate comparison has been arrived at by substracting from the 1933 figures those for reported accidents and eye injuries of "over three and under eight days." The comparison therefore is between reported accidents of seven days and over for 1919 and 1920, and of eight days and over for 1933.

Table III. (*a*) and (*b*) is a sub-classification of the 1933 figures in Table II.

### TABLE I.—INCIDENCE OF ACCIDENTS IN MINES.

(*a*) **Coal Mines (including Stratified Ironstone Mines).**

| Year | Total number of persons employed | Total number of all accidents reported (non-fatal) | Total number of eye accidents reported | Ratio of eye accidents per 1,000 persons employed | Percentage of eye to all accidents |
|---|---|---|---|---|---|
| 1919 | 1,191,313 | 117,422 | 4,467 | 3·75 | 3·5 |
| 1920 | 1,248,224 | 117,302 | 4,630 | 3·71 | 3·7 |
| 1933 | 797,294 | 106,612 | 4,575 | 5·73 | 4·2 |

(*b*) **Metalliferous Mines (other than Ironstone Mines).**

| Year | Total number of persons employed | Total number of all accidents reported (non-fatal) | Total number of eye accidents reported | Ratio of eye accidents per 1,000 persons employed | Percentage of eye to all accidents |
|---|---|---|---|---|---|
| 1919 | 21,661 | 1,107 | 29 | 1·3 | 2·6 |
| 1920 | 21,323 | 1,188 | 49 | 2·3 | 4·1 |
| 1933 | 9,807 | 608 | 16 | 1·6 | 2·6 |

## TABLE II.—Incidence of Accidents in Quarries.

| Year | Total number of persons employed | Total number of all non-fatal accidents reported | Total number of eye accidents reported | Ratio of eye accidents per 1,000 persons employed | Percentage of eye to all accidents |
|---|---|---|---|---|---|
| 1919 | 57,076 | 2,696 | 150 | 2·6 | 5·5 |
| 1920 | 67,750 | 3,571 | 190 | 2·8 | 5·3 |
| 1933 | 65,967 | 4,018 | 238 | 3·6 | 5·9 |

## TABLE III.—Incidence of Eye Accidents in Quarries.

### (*a*) Raising Igneous Rocks.

| Year | Quarry | Total number of persons employed | Total number of eye accidents reported | Ratio of eye accidents per 1,000 persons employed |
|---|---|---|---|---|
| 1919 | Igneous Rocks | 12,811 | 71 | 5·5 |
| 1920 | ,, ,, | 14,319 | 108 | 7·5 |
| 1933 | ,, ,, | 14,636 | 75 | 5·1 |

### (*b*) Other Quarries.

| Year | Quarry | Total number of persons employed | Total number of eye accidents reported | Ratio of eye accidents per 1,000 persons employed |
|---|---|---|---|---|
| 1919 | Other Quarries | 44,265 | 79 | 1·8 |
| 1920 | ,, ,, | 53,431 | 82 | 1·5 |
| 1933 | ,, ,, | 51,331 | 163 | 3·1 |

# APPENDIX X.

## Insurance Regulations in Germany, Switzerland, Denmark and other Countries.

*Note based on information supplied by courtesy of the International Labour Office.*

1. In Germany the regulations of the Mutual Insurance Association, which came into force as from 1st April, 1934, prescribe that the employer must install and maintain all premises, workplaces, plant, machines and implements in such a way, within the limits of technical possibility, as to protect the worker against the risk of accident or occupational disease. It is also his duty to regulate the work in his undertaking so as to avoid all danger, to give the insured persons the necessary instructions as to their conduct, and to see that the safety rules are observed.

2. The regulations provide further for the appointment of safety delegates so as to ensure supervision by the undertaking and by the workers themselves. The safety delegates must constantly make certain that the prescribed safety devices are regularly present and used ; they must also see that other safety measures are enforced and arouse interest in accident prevention among their fellow-workers.

3. Another feature of the regulations is the requirement that, when an employer orders machines, plant, vehicles, etc., he must prescribe that they shall be as safe as the state of technical knowledge permits, and that they have to be delivered complete with all the protection devices laid down in the safety regulations. In future, therefore, no machines or appliances can come into use in Germany unless they are duly fitted with guards and other protective equipment.

4. The regulations also prescribe that goggles, etc., must be provided and used. Thus, under " General Requirements," these regulations prescribe, *inter alia*, that—

> " for work, in which experience shows that eye injuries may occur, suitable means of protection, such as goggles, masks or screens, shall be provided and used."

5. Similar prescriptions are also contained in the special regulations for particular branches of work, such as oxy-acetylene welding and cutting.

6. In Denmark the requirement that no machines or appliances shall be taken into use unless duly fitted with guards or other protective equipment has been in force since 1913.

7. As regards protection against *eye accidents* generally many countries have provisions requiring goggles, etc., to be provided for workers employed on jobs where there is a danger of eye injuries ; in

most cases, however, there are no definite provisions respecting *the use* of goggles or other " personal " equipment ; and, in the absence of a definite requirement of this kind, it has very often proved difficult to induce the workers to wear goggles, etc., even if they were provided and readily accessible.

8. It is the practice in some countries, for example, Switzerland, that, if a worker is injured and it is proved that the accident was (wholly or partly) due to his own carelessness or to his not using the means of protection provided for his job, the amount of compensation may be reduced. This will be the case, for instance, if a machine grinder sustains an eye injury and it is proved—

(*a*) that goggles or other adequate protection had been provided by the employer ;

(*b*) that the management has formally requested (by means of works' regulations or otherwise) grinders to wear goggles when at work ;

(*c*) and that, in spite of this formal request, the injured had not used the goggles.

9. Another system of safety insurance carried out in several countries (for example, the United States of America, Canada, Switzerland and others) is the so-called *merit-rating system*. Under this system the insurance bearer is empowered to take into account, for the fixing of the " risk class," and of the accident insurance premiums of any given undertaking, the actual state of the undertaking in respect of safety. In other words, the insurance bearers may allow rebates or impose supplements on the ordinary premiums according to the costs in which a particular undertaking has involved them for the compensation of accidents happening in such undertaking. In many cases also this system is extended so as to allow reductions of insurance premiums to establishments possessing, for instance, a safety committee which works satisfactorily.

# APPENDIX XI.

## Occupational Accidents in America.

PROTECTION against accidents arising out of occupations has received much attention in the United States of America, and the work of the safety engineer and of safety organisations generally appears to be much more fully developed there than in this country. Mr. Louis Resnick, the Director of Industrial Relations in the National Society for the Prevention of Blindness in America, refers to the eye hazards of industrial occupations as among the most serious of all causes of blindness.* The estimate of at least 15 per cent. of the blindness in America as due to industrial hazards gives some indication of the extent of their problem, although the estimate is only approximate.

Mr. Resnick classifies the eye hazards of industry as threefold: Accident, disease, and excessive eye fatigue. Of these he considers the most serious to be the accident hazard. Among the means of prevention he places protective equipment of various kinds, revision of the process and re-arrangement of plant and rules of work, supervision and the training and education in safe practices of workmen and foremen. Emphasis is laid on two facts " (1) that mandatory rules concerning the use of goggles and other protective devices in particular operations, and the strict enforcement of these rules, are proving the most effective means of reducing eye injuries ; and (2) that it is worse than futile to establish mandatory or other stringent rules in plants where they cannot be enforced or where they are not supplemented by year-round educational activities and supervision that is not only sympathetic to organised accident prevention, but sincerely enthusiastic about it."

The National Society for the Prevention of Blindness in America have prepared a self appraisal form for the use of safety engineers and others concerned with the conservation of vision in industry in the belief that it is not safe to assume that the provision of protective devices, and the display of posters and other propaganda, really do cover the field of accident prevention. The form is designed to assess the eye hazards and to enable the works manager or responsible officer to devise practical methods of reducing or eliminating eye risks in factory or workshop.

The National Safety Code for the Protection of the Heads and Eyes of Industrial Workers, developed in 1921 by the United States Bureau of Standards, and revised and approved as " American Standard " by the American Engineering Standards Committee, gives a list of the processes requiring protection, divided into nine groups, each of which requires a protector having distinctive features. These groups are as follows:—

*Group A*.—Processes where protection from relatively large flying objects is required. *Examples* of these processes are chipping, calking, and some riveting operations.

* *Sight Saving Review*, Vol. 1, No. 2, June, 1931.

*Group B.*—Processes where protection from dust and small flying particles is required. *Examples* are scaling and grinding of metals, stone dressing, and some wood-working operations.

*Group C.*—Operations where protection from dust and wind is required. *Examples* are automobile driving, locomotive driving and firing, and outdoor electic welding, where there is no exposure to radiant energy.

*Group D.*—Processes where protection from splashing metals is required. *Examples* are babbitting, pouring of lead joints for cast-iron pipes, casting of hot metal if there is a possibility that water is present ; and dipping in hot metal baths.

*Group E.*—Processes where protection from gasses, fumes, and liquids is required. *Examples* are handling of acids and caustics, dipping in galvanizing tanks and some japanning operations.

*Group F.*—Processes where protection from an excessive amount of dust and small flying particles is required. *An example* of these processes is sand-blasting.

*Group G.*—Operations where protection from reflected light or glare is required. *Examples* are prolonged exposure to snow-covered ground, exposure to reflected sunlight from roofs, road-beds, &c.

*Group H.*—Processes where protection from injurious radiant energy with a moderate reduction in intensity of the visible radiant energy is required. *Examples* are oxy-acetylene and oxy-hydrogen welding and cutting ; open hearth Bessemer, and crucible steel making ; furnace work, electric resistance welding, brazing, and testing of lamps, involving exposure to excessive brightness.

*Group I.*—Processes where protection from injurious radiant energy with a large reduction of the visible radiant energy is required. *Examples* are electric arc welding and cutting.

The National Head and Eye Code, as it is referred to for brevity among safety men, offers the following definitions of the principal forms of material protection:—

*Protector.*—A protector is a device which is placed in front of the eyes, face or head, to afford protection from the hazards in industrial processes or from the natural elements.

*Goggles.*—Goggles are an optical device worn before the eyes, the predominant function of which is protection to the eyes only.

*Face Mask.*—A face mask is a device worn before the eyes and a portion or all of the face, the predominant function of which is protection to the eyes and face.

*Helmet.*—A helmet is a rigid device worn by the operator which shields the eyes, face, neck, and a portion or all of the other parts of the head, and is held in place by suitable means.

*Hood.*—A hood is a device which completely covers the head, neck, and portions of the shoulders so as to exclude dust and flying particles.

*Shield.*—A shield is a device to be held in the hand, or supported without the aid of the operator, the predominant function of which is protection to the eyes and face.

Strong arguments for close co-operation between the factory doctor, the eye specialist, when one is employed, and the safety engineer, are contained in an article on " The Co-operation of the Physician and the Safety Engineer in Saving Sight,"* by Dr. C. O. Sappington, Consultant in Industrial Medicine, and the National Safety Code already referred to is quoted as a basis for the acquisition of knowledge of eye protection by the safety engineer. Close co-operation between the doctor and the safety engineer should result in a partnership that makes use of the specialised training and experience of both men in the best interests of the workers and of the firm.

An exhaustive study of the whole problem of protection of workers in industry is contained in *Eye Hazards in Industrial Occupations,* by Resnick & Carris, which was issued by the National Society for the Prevention of Blindness in 1924, and which still holds a high place among books of reference. It is clearly and profusely illustrated, and was designed as a handbook for safety engineers, inspectors, industrial physicians and nurses, owners, managers or members of the operating staff, for government officials, representatives of trade associations and officers of social agencies.

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* *Sight Saving Review,* Vol. 5, No. 2, June, 1935.

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